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DISTRIBUTION OF THE TRUE FRESH-WATER FISHES IN THE PHILIPPINES

I. THE PHILIPPINE CYPRINIDÆ

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TWO PLATES

The study of the geographical distribution of plants and animals is of great importance in at least a twofold capacity. Not only does it enable us to trace the various organisms back to their center of origin and thus throw light upon the process of evolution, but it also aids us to form a picture of a given region during various periods of geologic time. This is especially true in an archipelago like the Philippines, to the formation of which corals and volcanoes have alike contributed enormously, where many of the larger islands have been formed by the coalescence of smaller ones, and where a remarkable rôle has been enacted by great seismic disturbances and the consequent lifting or dropping of great areas of land and sea.

The exceedingly rich marine fauna of the Philippines is the same in general as that of the rest of the East Indies, though a few northern species extend from Japan as far south as the Visayas. While no light can be thrown upon the geological history of the Philippines by a study of its marine fauna, an examination of the fresh-water fishes leads to some interesting and positive conclusions.

A large number of species is found in the Philippine lakes and rivers; but, as in most islands, the majority are marine or brackish-water species, or else they spawn in salt water and spend only a part of their life in fresh water. Examples

of the first are sharks, rays, sawfishes, and various ophichthyoid and murænid eels which ascend rivers 250 kilometers or more from the sea. Examples of the second group are the mullets or banak, Mugilidæ; some snappers, Lutianidæ; eels, Anguillidæ; baṅgos, *Chanos chanos*; some pampanos, Carangidæ; the ten-pounder, *Megalops cyprinoides*; some Holocentridæ; many Apogonidæ; some Teraponidæ; the Kuhlidæ; *Scatophagus argus*; some pipefishes, Syngnathidæ; and many gobies. Some of those just named ascend rivers but a short distance or to some lake; but others, as the eels, mullets, and gobies, go to the smallest streams and the most remote headwaters of Luzon and Mindanao, more than 300 kilometers from the sea. All of them return to the ocean when spawning time approaches, and this annual movement, whether of adults downstream, or the influx of myriads of young at the river mouths, has given rise to very important fisheries, especially in Luzon, Mindoro, and Mindanao.

There are left then the fishes that live exclusively in fresh water. However, a little consideration will show that not all of them are true fresh-water fishes racially or geologically, although of course they are such specifically or even generically. In nearly every stream one may find curious little fishes with elongated beaks that on examination are seen to have but the lower half extended while the upper half of the beak seems to have been cut off. These are the halfbeaks, near relatives of the flying fishes, and most of the species are exclusively marine, though the ones in question spend their whole lives in fresh water. Then, too, in some streams and lakes one will find gobies which do not go down to the sea; but, since their affinities are all marine, we may regard the fresh-water halfbeaks and gobies as recent immigrants, and therefore dismiss them from consideration as having little bearing upon a study of the geological history of the Philippines and the land connections of the various islands.

The catfishes, though a fresh-water group, include a number of representatives that have adapted themselves to life in either brackish or salt water, or to living indifferently in fresh or in salt water. Omitting these, we have in the Philippines the following exclusively fresh-water fishes thus far known: One group of catfishes of two species, including the *hito*, the Clariidæ; another group of catfishes with two species, the Siluridæ; the dalag, or Ophicephalidæ, with perhaps two species; the climbing perch, *Anabas testudineus*; the Osphronemidæ with

one species; and the carp family, or Cyprinidæ, with about twenty-eight species.

The hito, dalag, and climbing perch are of very doubtful utility in a study of distribution. The dalag, or haluan, *Ophiocephalus striatus*, is a fish of remarkable tenacity of life, grows rapidly to a large size, is of fair food quality, and has therefore been widely distributed by the Malays in their wanderings. As a result it occurs in all parts of the Philippines. I have authentic records of dalag being placed in remote mountain lakes by both Christian and pagan Filipinos, in one instance no other kind of fish living in the lake. Of even greater ability to live without water is the climbing perch, and it too has been carried about by Malays, though not to the same extent perhaps, as owing to its smaller size it is less desirable. The commonest of the fresh-water catfishes, the hito, *Clarias batrachus*, has also been widely distributed by man. Though it is a better food fish than the climbing perch, it is apparently not able to adapt itself to such a variety of conditions as either of the other two and hence has not such a general Philippine range.

Near the northern end of Palawan Island occur the only Philippine representatives of the Siluridæ, a family of catfishes of wide distribution in Europe, Asia, and the East Indies as far as Borneo. Our two species are closely related to others found in western Malaysia but have been separated from the rest of the world long enough to be not only specifically but also generically distinct from the Bornean-Sumatran forms from which they sprang. As they are small and of little value for food and occur in a remote and little-inhabited region they have never been distributed by man, while the geographical character of Palawan, its narrow elongate shape, and its lack of large watercourses or a central river system have effectually prevented their dispersal, so far as known.

On Cagayan Sulu Island, which is 64 kilometers from the coast of Borneo, is a species of *Trichopodus* which is confined to a small fresh-water lake there. This fish is evidently a survival of the days when Cagayan Sulu was an integral part of Borneo, and is the sole representative in the Philippines of this widespread species, which occurs from Bali and Borneo to Sumatra and Siam. Cagayan Sulu lies at the outer edge of what one may well call the Bornean continental shelf, the 100-fathom line, and the great deep of the Sulu Sea at its north has effectually prevented the further extension of this species into the Philippines.

There remains, accordingly, only the Cyprinidæ. The distribution of this family is strongly marked and corroborates to a remarkable degree the conclusions reached by a study of plants and other groups of animals. The Cyprinidæ is the largest family of fishes and is undoubtedly of Asiatic origin, with a secondary center of distribution in eastern North America. Sumatra and Borneo are the chief centers of cyprinid life in Malaysia. Cyprinids are totally lacking in Celebes and occur nowhere to the east of Borneo except in the Philippines, and nowhere east of Wallace's Line except on Lombok Island and, perhaps, on the neighboring island of Sumbawa, a single widespread species of *Rasbora* and one of *Barbodes* having succeeded in extending their range thus far eastward, probably before the formation of the straits of Lombok and Alas.

In the Philippines Cyprinidæ are apparently confined to Mindanao, Basilan, and Tawitawi, and to the Palawan biological province, where they occur on Balabac, Palawan, Busuanga, and Mindoro Islands. We are thus forced to the conclusion that there has been no land connection between Mindoro and Luzon, or else none since Cyprinidæ reached northern Mindoro. It is likewise evident that Leyte, Bohol, Cebu, and Negros have also been separated from Mindanao for a very long time, if indeed any of them except Leyte was ever connected with it. Leyte and Samar seem to have been formed by the fusion of a number of smaller islands, which have been alternately above and below sea level several times, so that Cyprinidæ would have been exterminated by salt water, if indeed the ancient islets ever possessed permanent streams of sufficient size to allow their immigration.

A study of the Cyprinidæ of Mindanao also leads to some interesting conclusions. This great land mass was once four or more separate islands, but cyprinids abound in all parts of Mindanao, whether lowland or elevated plateau regions. In the Lanao Plateau, a volcanic district with a large lake as the central feature, occur thirteen species of Cyprinidæ, although the fishes of Lake Lanao and its tributaries are separated from all other regions by the impassable barrier of Maria Cristina Falls. That this isolation took place a long time ago is shown by the fact that three genera and all of the species of Cyprinidæ living there do not occur elsewhere.

It is self-evident that the Palawan-Mindoro zoölogical province was populated by Cyprinidæ from Borneo, via Balabac. It is likewise evident that the migration must have occurred when

Palawan had a greater area than at present and probably at a time when the southern end of the China Sea was land, and a great river flowed northward, draining western Borneo and Sumatra. At this time, with larger streams in Palawan, it would have been comparatively easy for fresh-water minnows to extend their range northward. The relatively large number of endemic species in Palawan shows that this condition passed away a very long time ago.

Unquestionably, the Cyprinidæ of Mindanao entered from Borneo over a Sulu land bridge. Collections made during the summer of 1923 have shown the presence of cyprinids on Tawitawi and Basilan; but on Jolo, the only other island of the Sulu Archipelago large enough to have permanent fresh-water streams, they are apparently lacking. As far as we know, the only fresh-water fishes in Jolo are the ubiquitous dalag, and various gobies, eels, and other salt-water immigrants. The great amount of volcanic activity upon Jolo would probably have destroyed all Cyprinidæ if any ever did occur there. The endemic species at Zamboanga and on Basilan, the nearest points to Borneo, furnish proof that connection ceased a long time ago, while the numerous changes which most of the Sulu islands have undergone in elevation from time to time have destroyed any cyprinids which might otherwise have occurred there.

There are approximately one hundred eight species of Cyprinidæ known from Borneo, in contrast to the twenty-eight native Philippine species thus far collected. Of these one species is common to Borneo, Mindanao, and the Palawan *Gebiet*. One species is known only from Zamboanga and Borneo; one from the Palawan *Gebiet* and Borneo; one is confined to Mindoro, and one to Busuanga; one is thus far known from Palawan, Balabac, and Busuanga, while three species are confined to Palawan. Thirteen are limited to the plateau of the Lake Lanao region in Mindanao.

The lack of recent land connections between Formosa and the Philippines is also indicated by an examination of the fresh-water fishes of Formosa, which shows that there is no specific relationship between them and the fresh-water fishes of the Philippines and Malaysia.

Of the fresh-water fishes of Formosa more than 61 per cent are endemic, after deducting those artificially introduced or those which are wholly or partially marine or are really brackish-water forms. The nearest relatives of these endemic species are

found in China, Korea, or Japan, and the majority of the fishes belonging to their genera occur in British India, Indo-China, and China.

The whole fresh-water fauna, endemic and widespread species alike, shows close relationship to the neighboring continental forms. Eleven species are of more or less general distribution, from southern China to Korea and Japan, one only on the Chinese mainland, and one only in Japan. Seven species belong to a more southerly realm, occurring in Indo-China and southern China northward to, but not beyond, the Yangtze.

An examination of the related species shows that all Formosan species with Chinese affinities have changed into more or less distinct species, while those ranging also southward into Indo-China are unchanged. Of the species not peculiar to Formosa, 80 per cent occur on the Chinese mainland. It would seem, therefore, that the fresh-water streams of Formosa were first occupied by fishes from the streams of China long enough ago to give them time to be altered, while the species with southern affinities came through southern China at a much later date and are consequently unaltered.

There is but one species recorded from both the Philippines and Formosa, and as it is also found in southern China there is no reason to believe that it reached Formosa via Luzon.

The absence of trout in the Baguio Plateau of northern Luzon, where the conditions are not greatly dissimilar to those in the highlands of Formosa in which a species of trout does occur, would seem to corroborate the statement that the Bashi Channel is an old one and that there has been no connection between Luzon and Formosa since Miocene time or even earlier. Fossil trout are known from Pliocene and Pleistocene deposits in Idaho, and from the Miocene in Bohemia. Therefore, we may be reasonably certain that if there ever was any connection between Formosa and Luzon it was broken a long time ago, so that the only land connection by which fresh-water fishes could arrive in the Philippines was that with Borneo. The true fresh-water fishes of the Philippines must then be considered as having been wholly derived from western Malaysia.

CYPRINIDÆ

This enormous family of fishes, comprising about two hundred genera and more than two thousand species, is one of the most difficult groups with which the zoölogist must deal. A few sub-families are readily recognizable, but many of the genera are

separated by characters that are not visible to the casual observer; in addition most of the species have a strong resemblance, and very careful study is necessary to distinguish them. The structure of the mouth parts, which is frequently very complicated, and the number and arrangement of the pharyngeal teeth are the chief generic characters, and often very close scrutiny is required to enable one to determine them correctly. The great similarity of form, fins, scales, and color makes the determination of species a highly critical matter in many genera, especially when they are rather small, as is often the case. The color and the proportions vary considerably between the young and the adults in many species. In many genera, the males become very brilliantly colored during the breeding season. In a great many species the male, during the breeding season, has the snout and head more or less covered with small grayish tubercles or pearly spots, outgrowths of the epidermis, which fall off later.

The Cyprinidæ are as a whole of little value as food fishes, being mostly small, very bony, and of poor flavor. One species, *Cyprinus carpio* L., Chinese carp, now of almost world-wide distribution, is in many regions of very considerable economic importance. It has become established in Pulangi River, Cotabato, and in Lake Nunungan, Lanao, and in time will probably become an important source of food in Cotabato and in Lanao Province, Mindanao. Goldfish, *Carassius auratus* L., are raised everywhere for ornament or as curiosities; but, although plentiful in the Philippines in cultivation, they have not become naturalized in Philippine streams. The only Philippine locality where Cyprinidæ are of real importance is Lake Lanao, where they form the main protein food of the Moros about the lake. In addition to the considerable number of species from Lake Lanao, described in this paper, one other is known to live in the lake, but as yet I have been unable to secure specimens of *baoulan*, as it is called in Marinao. It probably lives at a considerable depth, since it is never seen except during the coldest season after severe storms, when it comes to the surface. My informants particularly mention its great thickness from side to side and the fact that it is so fat that it fries in its own grease, not requiring the addition of any cooking fat. It is the most highly prized of the Lanao cyprinids, but is rarely obtained.

Cyprinidæ have no teeth in the jaws, but are characterized by one, two, or three rows of specialized teeth on the pharyngeals. Cyprinidæ are mainly vegetarian, but also eat more or less ani-

mal food, some species and genera being in fact predatory upon other fishes. Some Philippine species feed upon *Potamogeton* and similar water plants, some eat crustaceans, and some swallow slime and mud for the sake of its organic matter. Perhaps all of them eat worms and the eggs of other fishes, thus checking the increase of carnivorous fishes. The chief importance of Cyprinidæ in the economy of nature is that of furnishing food to the more valuable predatory fishes of rivers and lakes. Owing to their small size, profuse spawning, great swimming power, and ability to find food anywhere, they occur in vast numbers throughout their range and may be reckoned among the most successful of fishes.

Their ability to ascend hillside streams is astonishing. *Barbodes binotatus* may be found in springs hundreds of feet above the mountain stream below, to reach which it must go up a torrential brook, full of cascades and seemingly impassable waterfalls. While the common carp thrives in muddy water, most Philippine Cyprinidæ live in clear streams and lakes.

In 1840 Jacob Heckel described two species of *Cyrene*, now classified as *Dangila*, giving the locality as the Philippine Islands. I am unable to learn anything of the origin of his specimens, which were described in the Fishes of Syria, in Russegger's Reisen. It is possible that they were collected by Cuming in the Malay Peninsula or Sumatra and that the labels became mixed, as was the case with his botanical material collected at Malacca. Bleeker states that Heckel was the first to demonstrate the existence of cyprinids in the rivers of Borneo and Luzon, but adduces no proof of his use of Luzon in this connection. In the eighty-three years that have elapsed since Heckel's paper appeared nothing resembling *Dangila* has been collected in the Philippines. While this is no proof of their absence, I cannot accept them as a part of the Philippine fish fauna until their presence is demonstrated by their collection here.

FAMILY CHARACTERS

The head and body are compressed, very rarely depressed; the margin of the upper jaw is formed by the premaxillaries alone; the lower pharyngeal bones are well developed (absent only in *Gyrinocheilus*), falciform, nearly parallel with the gill arches, each bone with one to three series of teeth, four to seven in the outer row, with a smaller number in the other rows if present. The head is naked, the body scaly except in a few extra-Malaysian genera; eyes with a free margin which may form a gelatinous eyelid; barbels four, two, or absent, but

present in all Philippine genera; gill openings generally wide, the membranes broadly joined to the isthmus; branchiostegals always three; gill slits four, a slit behind the fourth; pseudo-branchiæ present in Philippine species; air bladder divided into two portions, the posterior of which may be reduced, the anterior in Philippine species not inclosed in bone; dorsal short or long, its origin before, opposite, or behind that of ventrals; anal short or long, its origin opposite or behind that of dorsal; arrangement of lips and jaws and their covering varying widely; no pyloric cæcæ; no adipose fin; lateral line usually complete.

In this paper the length recorded in most cases is that from the tip of the snout to the base of the caudal fin. Where the caudal fin is included it is specifically so stated.

In some species the scales of the lateral line are often irregular in number and size, due apparently to the interpolation of small scales which replace larger ones that have been injured or lost. In such cases the extra number has not been given as a diagnostic specific character but, instead, the number that is deemed typical of the species. In giving the transverse series of scales,

as in the formula $\frac{4.5}{2.5}$ the number 4.5 signifies that there are 4.5 rows of scales between the origin of the dorsal fin and the lateral line, while the other number, 2.5, means that there are 2.5 rows of scales between the lateral line and the anus; the lateral line itself is not counted. It is necessary in examining specimens to count the lateral line on both sides, since there is often a marked discrepancy between the two sides.

The number of dorsal spines is given incorrectly by many authors; the first dorsal spine is often very small, but is plainly seen if care is used in looking for it. Nearly all Philippine species of *Barbodes* have four dorsal spines, and not three, as often given.

Key to the subfamilies of Philippine Cyprinidæ.

- a*¹. All or part of abdomen compressed to an edge..... Abramidinæ.
- a*². Abdomen rounded or sometimes flattened, but not compressed to an edge.
 - b*¹. Lower jaw generally with a knob at symphysis, fitting in a notch in the upper one; dorsal without osseous spine, its origin behind that of ventrals; lateral line abruptly bending downward, if complete running along lower half of tail..... Rasborinæ.
 - b*². No knob at symphysis of lower jaw; dorsal usually with osseous spine, its origin before or above that of ventrals; if behind them, the dorsal has a strong osseous spine; lateral line running in the middle of tail..... Cyprininæ.

ABRAMIDINÆ

The oblong body elongate to very elongate, and compressed to greatly compressed; abdomen or a part of it compressed below to a sharp edge.

Dorsal short, with seven to ten branched rays, and opposite to space between ventrals and anal or to anal; it may be without an enlarged spine or the third one may be bony and smooth (in one case serrated behind); anal moderate to very long, with twelve to forty-eight branched rays; ventrals absent in one genus, present in all others; pectorals more or less elongate; caudal forked; mouth terminal, subinferior or strongly oblique with prominent lower jaw and a knob sometimes present at symphysis, a pair of maxillary barbels in Philippine species, none present in other genera; scales small to medium, with the lateral line in the lower half of tail or in the middle, gill openings reach to below eye or preoperculum; pharyngeal teeth in a single, double, or triple series.

Represented in the Philippines by a single genus.

Genus NEMATABRAMIS Boulenger

Nematabramis BOULENGER, Ann. & Mag. Nat. Hist. VI 13 (1894) 249.

MearnSELLA SEALE and BEAN, Proc. U. S. Nat. Mus. 33 (1908) 231.

The oblong body very strongly compressed laterally, the belly having a sharp, cutting edge; dorsal profile slightly convex, the nape more or less concave; ventral profile strongly convex; mouth moderate, oblique, with protractile upper jaw; lower jaw slightly projecting, with a more or less developed knob at symphysis, which fits into a shallow notch in upper lip; a pair of long thin maxillary barbels; eye with a free orbital margin; dorsal short, without osseous spines, its origin opposite to that of anal, the latter with twelve to eighteen rays and much longer than dorsal; ventrals with five or six branched rays, separated by one scale from lateral line; pectorals longer than head; caudal deeply notched; lateral line bent down abruptly behind pectoral fin and continued backward near ventral profile; pseudobranchiæ present; gill rakers short; branchial opening reaching beneath eye; pharyngeal teeth hooked, in two series, 5, 4 to 4, 5.

This genus is known only from the Philippines and Borneo.

Key to the Philippine species of Nematabramis.

α^1 . Barbels shorter than head.

b^1 . Depth 2.6 in length..... *N. verecundus*.

b^2 . Depth 3.25 to 4 in length..... *N. alestes*.

α^2 . Barbels one and one-half times to twice as long as head.... *N. everetti*.

*Nematabramis verecundus*¹ sp. nov.

Dorsal II, 8; anal III, 12; pectoral I, 9; ventral I, 5; lateral line, 30 on one side, 32 on the other; transverse line, $\frac{6.5}{1}$; scales from nape to dorsal, 22; scales on caudal peduncle, 13.

Body elongate, the dorsal profile nearly straight, the ventral profile uniformly convex from chin to tail; depth $2\frac{5}{8}$ in length, head 3.5; eye 4 in head, 1.5 in interorbital space, and longer than snout; mouth strongly oblique, lower jaw prominent, its tip higher than upper margin of pupil, with very small symphy-sial knob fitting into a shallow curve in the protractile upper lip; posterior end of maxillary lies beneath anterior margin of eye; maxillary barbels $\frac{5}{8}$ as long as head, hardly extending to middle of opercle; origin of dorsal more than twice as far from tip of snout as from caudal, slightly behind that of anal, and behind the nineteenth scale of lateral line, its height $1\frac{5}{7}$ in head; origin of anal opposite eighteenth scale, its height $1\frac{1}{3}$ in head; pectoral long, pointed, extending well beyond base of ventral, $1\frac{1}{12}$ times head; ventrals small, less than half the head and covering not quite 0.7 of the distance to anus; length of caudal peduncle 1.55 in head, depth 1.9 in its length and 3 in head; caudal fin damaged.

Color in alcohol brownish, darker above, pale yellowish gray on sides and belly; a median blackish brown stripe from nape to caudal; top of head dusky; a dark bar from shoulder to caudal, with a black line more prominent posteriorly and terminating in a triangular black spot just before caudal fin; a large dark blotch on side above anterior portion of pectoral and two smaller blotches below and anterior to it; scales outlined or specked by dark dots; anal dusky, especially anteriorly; posterior margin of caudal dusky; other fins more or less dark dotted or fading out to clear; opercle apparently with a dark spot, but really colorless and transparent, the dark gills showing through.

¹ *Verecundus*, modest.

Here described from the type and only specimen, 42 millimeters long, obtained by me in Titunod River, Kolambugan, Lanao Province, Mindanao.

Nematabramis alestes (Seale and Bean).

Mearnsella alestes SEALE and BEAN, Proc. U. S. Nat. Mus: 33 (1907) 231, fig. 2.

Nematabramis alestes JORDAN and RICHARDSON, Check List of Philippine Fishes (1910) 12.

Dorsal II, 8-9; anal III, 12-13, very rarely 14; pectoral I, 11-12; ventral I, 6-5; lateral line, 34-37; transverse series, $\frac{5.5-7.5}{1.5}$; scales from nape to dorsal, 22-23; scales around caudal peduncle, 13-14, more rarely 12.

Body oblong, much compressed, dorsal region elevated in a low curve, or convex from snout to dorsal, top of head straight, head usually bent upward with a slight depression at nape; the ventral profile strongly convex from chin to caudal fin; depth from 3.25 to 4 in length, head from 3.75 to 4.4; eye 3.4 to 4.2 in head, equal to or 1.3 in snout, and 1.4 to 1.8 in interorbital space, which is depressed centrally and has six or seven pairs of transverse marginal bony ridges; mouth large, terminal, oblique, posterior margin of maxillary extending beyond anterior of eye; upper lip thin, slightly protractile, with a small median curve or notch into which fits a small knob on tip of lower lip; lower jaw projecting or the jaws equal; maxillary barbels very slender, from less than $\frac{1}{2}$ to $\frac{2}{3}$ as long as head, not extending beyond middle of operculum; dorsal opposite anal, its origin behind that of anal and behind twentieth or opposite twenty-second scale of lateral line, its height $1\frac{1}{3}$ to $1\frac{1}{2}$ in head; distance from dorsal to caudal more than half the distance from dorsal to tip of snout; anal slightly higher than dorsal, opposite nineteenth or twentieth scale, its length nearly equal to or 0.75 that of head; pectoral pointed, 0.1 or 0.2 longer than head, tip extending beyond origin of the small ventrals, which are from 1.6 to 1.7 in head and from 0.68 to 0.8 as long as distance from ventral origin to anus; length of caudal 1.4 to 1.66 in head, its least depth $1\frac{1}{3}$ to 1.66 in its length or 2.3 to 2.4 in head; caudal slightly to considerably longer than head, broadly notched, the lower lobe larger, the shortest rays half or more than half as long as the longest rays.

Color of fresh alcoholic specimens dusky above, paler below to pale yellowish on sides and belly with a bright silvery luster over all; a wide dark silver lateral band from opercle to base of caudal, where it is more or less enlarged; an obscure black blotch in band over anterior portion of pectoral, with one to several vertical dark marks below it; top of head blackish; a very dark line from nape to base of caudal along middle of back; opercle and preopercle shiny silver; scales more or less faintly outlined by dark dots; dorsal, anal, margins, and posterior margin of caudal more or less dusky or blackish; other fins colorless or the rays faintly dusky.

Color in alcohol after fifteen years yellowish, dark brown above, paler to whitish on belly, with a silvery luster over all, operculum and preoperculum bright silver; a dark silvery lateral stripe from opercle to caudal, ending in a circular or triangular dark spot; three more or less well developed vertical dark marks in the lateral bar above anterior half of pectoral; traces of a median dark line on back from nape to dorsal; scales faintly outlined with dark dots; membranes of dorsal, anal, and caudal darkened by minute dots; other fins colorless.

Here described from fifteen specimens, 58 to 96 millimeters long, collected by Alvin Seale at Zamboanga, the type locality, in 1908, and sixteen specimens, 45 to 82 millimeters long, collected by Mr. Seale at Puerto Princesa, Palawan, in 1908; eight specimens, 36 to 48 millimeters long, from a pool in the dried bed of a stream near Taytay, Palawan, collected in 1913; and twelve specimens, 66 to 97 millimeters long, collected at Concepcion, Busuanga, by G. A. Lopez, in 1922.

This species is subject to considerable variation in the scales and fin rays. While it is close to both *N. everetti* and *N. steindachneri*, it may be distinguished at a glance from either by the much shorter barbels and the smaller number of rays in the anal fin.

This species is known only from Zamboanga, Basilan, Palawan, and Busuanga, but probably occurs on Tawitawi and Balabac, and in northern Borneo.

Since I wrote the above G. A. Lopez, of the Bureau of Science, has obtained the following specimens on Basilan Island: Eight specimens, 64 to 90 millimeters long; six specimens, 50 to 75 millimeters long, from Lamitan River; eleven specimens, 32 to 83 millimeters long, from Burakan River; two specimens, 51

and 66 millimeters long, from Busay River; and sixteen specimens, 40 to 87 millimeters long, from Balactasan River.

Nematabramis everetti Boulenger.

Nematabramis everetti BOULENGER, Ann. & Mag. Nat. Hist. VI 13 (1894) 250, 15 (1895) 187; WEBER and BEAUFORT, Fishes Indo-Austr. Arch. 3 (1916) 46.

Dorsal II, 8, 9-12; anal III, 16-18; pectoral I, 10; ventral I, 5; lateral line, 35-37; transverse line, $\frac{6.5-7.5}{1.5-2}$ (at origin of dorsal); scales from nape to dorsal, 24; scales on caudal peduncle, 12.

Height 3.25 to nearly 3.75, about 4.6 in length with caudal; head 4.3 to 4.5, 5.4 in length with caudal. Eye 3.6 to 4, shorter than snout and interorbital space. Barbels one and a half times to twice as long as head. Origin of dorsal above twentieth scale of lateral line, twice as far from end of snout as from base of caudal. Height of dorsal slightly more than length of head without snout. Origin of anal below eighteenth scale of lateral line, its height somewhat more than that of dorsal. Ventrals a little nearer to end of snout than to base of caudal. Pectorals $1\frac{1}{3}$ times as long as head, extending beyond base of ventrals. Least height of caudal peduncle more than twice in length of head and 1.7 in its own length. Length, 110 millimeters.

Color pale, with a silvery lateral stripe. Description compiled from Boulenger and from Weber and Beaufort. Originally described from Borneo.

I have included this species on the strength of Boulenger's record cited above, but its presence here seems doubtful. It is impossible to state whether the specimens named by Boulenger were collected on Balabac or on Palawan.

RASBORINÆ

The compressed, oblong or elongate body more or less rounded on ventral side of belly; no bony dorsal spine, fin short or of moderate length, with from six to sixteen soft rays, its origin behind that of ventrals; anal with from five to seventeen branched rays, its origin usually below posterior end of dorsal; pectorals and ventrals always present and caudal forked. Mouth terminal, oblique, with lower jaw usually projecting and with a knob at symphysis which fits into a notch in upper jaw; a pair of rostral and maxillary barbels may be present, or the maxil-

lary or both pairs may be vestigial or absent. The scales may be of small, medium, or large size; if the lateral line is present it bends abruptly downward, and if complete it runs along the lower half of tail. Gill openings extend forward to below preoperculum or to below eyes. Pharyngeal teeth lanceolate or hooked, in one or three rows.

Of the four East Indian genera known, only the one given below is represented in the Philippines. It may be recognized by the total absence of barbels, the others having at least one pair present, though it may be in a rudimentary form.

Genus *RASBORA* Bleeker

Rasbora BLEEKER, Nat. Tijdschr. Ned. Ind. 20 (1859-60) 435.

Body oblong or elongate, with a rather small, oblique mouth, and a prominent lower jaw with a knob at symphysis which fits into a more or less evident notch in upper jaw. There are no barbels. Dorsal has seven or eight branched rays; its origin is between that of ventrals and anal; the latter fin is short and has five branched rays. Scales of medium or large size. The lateral line bends downward abruptly, and if complete runs along lower half of caudal peduncle. Gill openings reach below preoperculum and the gill membranes are connected with the isthmus opposite pupil of eye; pseudobranchiæ present. The hooked pharyngeal teeth are in three rows, 5 to 4, 4 to 2, 1 or 2-1 or 2, 2 to 4, 4 to 5.

This genus ranges from the Philippines and Sumbawa, throughout eastern and southern Asia; one species is found in Africa. Four species are known from the Philippines.

Key to the Philippine species of Rasbora.

α^1 . Lateral line incomplete, not extending beyond anal..... *R. taytayensis*.

α^2 . Lateral line complete and reaching caudal.

b^1 . Seven rows of scales between lateral lines over middle of caudal peduncle; lateral line, twenty-six; scales between nape and dorsal, twelve *R. lateristriata*.

b^2 . Nine rows of scales between lateral lines over middle of caudal peduncle.

c^1 . Scales in lateral line, twenty-six; scales between nape and dorsal, ten *R. punctulatus*.

c^2 . Scales in lateral line, twenty-eight to thirty-two; scales between nape and dorsal, twelve to thirteen.

d^1 . Origin of dorsal midway between tip of snout and caudal; least depth of caudal peduncle 1.9 to 2 in its length; maxillary not reaching eye..... *R. argyrotaenia*.

d^2 . Origin of dorsal nearer caudal than tip of snout; least depth of caudal peduncle 1.44 to 1.77 in its length; maxillary extending to front margin of eye..... *R. philippina*.

Rasbora taytayensis sp. nov.

Dorsal II, 7; anal III, 5; pectoral I, 12; ventral I, 7; lateral line incomplete, 15 to 17; longitudinal series of scales, 26, 28; transverse series, $\frac{4.5}{1}$; scales from nape to dorsal, 11.

Dorsal profile nearly straight, the back but little arched, ventral profile strongly convex; depth 3.25 to 3.57 in length; head equal to depth or shorter, 3.5 to 3.77 in length; eye large, 3 to 3.5 in head and from $\frac{1}{4}$ to $\frac{1}{3}$ longer than the short blunt snout; interorbital space flat, 2.2 to 2.55 in head, from 0.25 to more than $\frac{1}{3}$ wider than eye diameter; mouth rather wide, very oblique, the posterior margin not reaching eye; lips thin, sub-equal or the lower projecting, with a prominent knob at symphysis fitting into a median notch in upper lip; origin of dorsal behind the tenth scale of the lateral line, nearer to caudal than to tip of snout, but much nearer ventrals than anal, its height slightly less than length of head; pectoral not reaching ventral, 1.1 to 1.3 in head; origin of ventral opposite ninth scale of lateral line, its tip about reaching anus; anal height 1.2 to 1.36 in head; length of caudal peduncle 1.27 to 1.37 in head, its least depth 1.25 to 1.57 in length; caudal deeply forked, longer than head, the longest rays of the pointed lobes less than twice as long as the shortest rays, nine rows of scales between the lateral lines, counting over the back just in front of dorsal; the lateral line never extends beyond anal and often does not reach it.

Color in alcohol silvery brown, very dark above, paler below: a narrow black stripe on back from nape to caudal; a blackish or dark silver line or band along the side on posterior half of body, with a black circular spot at base of caudal; below this is a broad dark band, beginning behind eye, best developed anteriorly, and composed of many fine dots; a dark brown bar behind posterior margin of gill opening; scales margined with many fine dark spots; a band of many black spots along base of anal; fins colorless or their rays more or less dark dotted.

Here described from six spawning females, 38 to 50 millimeters long, collected in a pool in the bed of a dry stream on the trail between Taytay and Malampaya Sound, Palawan, in 1913. I have also examined one hundred sixty-four specimens, 18 to 45 millimeters long, collected from a creek near Taytay, Palawan,

at the same time. This species is nearest to *Rasbora semilineata* Weber and Beaufort, but is quite distinct.

Rasbora lateristriata Bleeker.

Leuciscus lateristriatus BLEEKER, Nat. Tijdsch. Ned. Ind. 7 (1854) 94.
Rasbora lateristriata BLEEKER, Ichth. Arch. Ind. Prod. 2 Cyprini
 (1860) 441; Atlas Ichthy. 3 (1863) 121; GÜNTHER, Cat. Fishes
 Brit. Mus. 7 (1868) 195; WEBER and BEAUFORT, Fishes Indo-Austr.
 Arch. 3 (1916) 76.

Dorsal II, 7; anal III, 5; lateral line, 26; transverse line, 4.5; scales between nape and dorsal, 12; scales between lateral line over middle of caudal peduncle, 7.

Depth 4.5 times, head 3.85 times in length; eye 3.5 times in head, $1\frac{1}{3}$ times in the broad interorbital space, and nearly as long as snout which goes 3 times in head; mouth strongly oblique, its anterior end as high as upper margin of pupil; maxillary extends posteriorly beneath anterior margin of eye; origin of dorsal opposite tenth scale of lateral line in my specimen ("opposite to 11th lateral scale or one scale less or more," according to Weber and Beaufort) and nearer caudal than tip of snout; height of dorsal less than depth of body, about $1\frac{1}{3}$ in length of head and equal to length of pectoral; origin of ventrals behind eighth scale of lateral line and nearer anal than opercle; least depth of caudal peduncle twice in its length; caudal deeply and broadly forked, badly broken in my specimen.

Color in alcohol.—Whitish to yellowish on sides and below, scale margins more or less indicated by broad bands of minute dark dots; dorsal region dark brown; top of head blackish brown and a narrow blackish stripe from nape to caudal fin; a silvery black spot on opercle; a narrow silvery black stripe along side, beginning behind opercle, darker and more conspicuous along posterior half, bordered above and especially below by a broad band composed of minute dark specks.

A single specimen, 81 millimeters long, was obtained in Malum River, Tawitawi, by G. A. Lopez, September 21, 1923.

This species is split into several well-marked varieties by Weber and Beaufort, and occurs from Sumatra to Borneo, Lombok, and Sumbawa. My specimen agrees fairly well with Weber and Beaufort's description of this widely distributed species.

Rasbora punctulatus Seale and Bean.

Rasbora punctulatus SEALE and BEAN, Proc. U. S. Nat. Mus. 33 (1907) 232, fig. 3.

Dorsal II, 7; anal III, 5; lateral line, 26; transverse line, $\frac{5.5-4.5}{1-1.5}$; scales between lateral lines over middle of caudal peduncle, 9; scales between nape and dorsal, 10; pharyngeal teeth, 5, 3, 2-2, 3, 5.

Body slender, the dorsal profile more strongly arched than the ventral. Depth 3.1 to 3.5 in length, head 3.75 to 4.16; eye 2.8 to 3 in head, equal to the flat interorbital and longer than the short blunt snout, which is 4 to $4\frac{2}{3}$ in head in my specimens, 3.5 in the type; mouth oblique, its upper end upon or above a level with upper border of pupil; lips thin, equal, the upper one conspicuously notched to receive the projecting pointed tip of lower jaw; origin of dorsal midway between tip of snout and caudal fin, or a little before or behind the middle, and opposite ninth or tenth scale of the lateral line, its height equal to or 1.25 in head; pectoral equal to or 1.1 in head; tip sometimes reaches ventral but usually not; origin of ventral opposite eighth or ninth lateral-line scale, much nearer anal than operculum, the tip reaching anus; height of anal 1.3 to 1.5 in head; length of caudal peduncle 1.25 to 1.4 in head, its least depth 1.4 to 1.7 in its length; caudal deeply forked, with narrow pointed lobes, the longest rays a third longer than head and about twice as long as the shortest rays.

Color after fifteen years in alcohol yellowish brown with a silvery luster over all; a broad dark silver band from opercle to caudal fin, scales broadly outlined by minute dark dots; fins colorless, or pectoral rays minutely dark dotted.

Here described from twenty-eight specimens, 39 to 56 millimeters in length, collected by Alvin Seale at the type locality, Zamboanga, Mindanao.

I have recently received thirty-eight specimens from Basilan Island, varying in length from 27 to 65 millimeters; twenty-eight are from Balactasan River and six from Burakan River. The color of fresh formalin specimens was brownish above, becoming whitish on the belly, with a longitudinal blackish band or line from the shoulder along the side to the middle of the caudal; the scales were mostly outlined by broad bands of fine dark dots; the fins were suffused with red.

Rasbora argyrotaenia Bleeker.

Leuciscus argyrotaenia BLEEKER, Verh. Bat. Gen. 23 (1850) Ichth. Midden- & Oost-Java, 21.

Rasbora argyrotaenia BLEEKER, Ichth. Arch. Ind. Prodrum. 2 Cyprini (1860) 448, Atlas Ichth. 3 (1863) 123, pl. 132, fig. 3; GÜNTHER, Cat. Fishes Brit. Mus. 7 (1868) 195; WEBER and BEAUFORT, Fishes Indo-Austr. Arch. 3 (1916) 61.

Rasbora everetti BOULENGER, Ann. & Mag. Nat. Hist. VI 15 (1895) 187.

Dorsal II, 7; anal III, 5; pectoral I, 12-14; ventral I, 8; lateral line, 28-32; transverse line, $\frac{4}{1 \text{ or } 2}$; scales from nape to dorsal, 12-13; scales between lateral lines on caudal peduncle, 9, rarely 8; pharyngeal teeth, 5, 3, 2-2, 3, 4 and 5, 3, 2-1, 4, 5.

Body elongate, back but little arched or nearly straight, ventral profile convex; depth 3.7 to 4.3 in length, head 3.5 to 4; eye equal to snout or nearly so, 3.1 to 3.57 in head; interorbital space flat, hardly exceeding eye or 1.4 times eye; cleft of mouth oblique, its upper end about as high as upper margin of pupil, maxillary not extending as far posteriorly as anterior margin of eye; lips thin, equal, the lower one not projecting, the upper one moderately protractile, with a small median notch into which the knob at mandibular symphysis fits; lower jaw comparatively heavy, prominent, sometimes with an external projecting knob at symphysis; origin of dorsal midway between tip of snout and caudal, opposite twelfth scale of the lateral line, nearer to ventral than anal, its height 1.25 to 1.5 in head; pectoral 0.8 to 0.85 as long as head, or as long as from tip of snout to posterior margin of preopercle, or more, but never as long as head and not reaching ventral; origin of ventral behind tenth lateral-line scale, slightly nearer anal than operculum; tip not reaching anus; length of caudal peduncle from 0.71 to 0.92 of head, its least depth 1.9 to 2 in its length; the deeply forked caudal fin as long as or longer than head, its longest rays twice or a little more or less than twice the shortest rays; the pharyngeal teeth subject to much irregularity.

Color in alcohol yellowish brown with a silvery sheen over all, darker above and pale or whitish beneath; a narrow blackish stripe along back from nape to caudal fin; a broad blackish or bluish silver band from shoulder along middle of side, ending just before caudal fin, widest on posterior half of body; operculum more or less bright shining silvery; scales more or less

margined by brown lines or dots; fins colorless or their rays punctulated with minute dark dots, the posterior border of caudal narrowly margined with blackish.

The above description is based upon thirty-nine specimens, 68 to 109 millimeters in length, obtained at Langbuan, Busuanga, in September, 1922. While most of them are mature, none are in spawning condition though the eggs and sperm are somewhat developed in some. I have also examined several hundred specimens, mostly 16 to 30 millimeters long, but ranging up to 100 millimeters, collected by Prof. A. L. Day in Lake Manguao, northern Palawan, in May, 1913; and twelve specimens, 48 to 65 millimeters in length, collected by Alvin Seale at Puerto Princesa, Palawan, in 1908.

While *R. everetti* Boulenger differs somewhat from the published accounts of *R. argyrotaenia*, I follow Weber and Beaufort in placing it in the synonymy. This species undoubtedly occurs throughout the Calamianes and Palawan; Boulenger's specimens probably came from Puerto Princesa. It is to be expected from Mindoro, though it may not have gone so far north, and must be in Balabac. Elsewhere it is found from Borneo to Java, Sumatra, the Malay Peninsula, Siam, and Annam. This handsome species is said to reach a length of nearly 170 millimeters. I have omitted much of the synonymy given by Weber and Beaufort.

***Rasbora philippina* Günther.**

Rasbora philippina GÜNTHER, Challenger Exp., Zool. 1 Shore Fishes (1880) 58.

Dorsal II, 7; anal III, 5; pectoral I, 13, 14; ventral I, 7; lateral line, 29, 30; transverse line, $\frac{4.5}{1}$; scales between nape and dorsal, 12; pharyngeal teeth, 5, 4, 1-1, 4, 5.

Body elongate, little elevated, the ventral profile more convex than the dorsal; top of head straight to nape, gently arched from there to dorsal fin; depth 3.3 to 3.8 in length, head 3.8 to 4; eye 2.5 to 3.2 in head, equal to or 1.3 in the nearly flat interorbital space; snout short, 1.2 to 1.25 in eye, 3.2 to 3.6 in head; mouth quite oblique, its upper end about level with upper border of pupil, its lower end not extending posteriorly to front border of eye, which however is reached by maxillary; lips thin, the upper one with a median notch into which the symphysial knob of the projecting lower jaw fits; origin of dorsal nearer to caudal than to tip of snout, much nearer origin of ventral than anal, opposite tenth or eleventh scale of lateral

line, and a little behind ventral, which is behind ninth or opposite tenth scale; distal margin of dorsal slightly convex, its height 0.75 to 0.8 that of length of head; margin of anal concave, its height a trifle more or less than 0.75 of dorsal; pectorals 1.2 to 1.33 in head, their tips not reaching ventrals; ventrals 1.45 in head, not reaching anus, their origin nearer to anal than to operculum; caudal longer than head, the longest rays more than twice as long as the shortest rays; length of caudal peduncle $1\frac{1}{8}$ to 1.4 in head, its least depth $1\frac{4}{9}$ to $1\frac{7}{9}$ in its length; nine rows of scales between the lateral lines counted over the back above anal fin, seven to nine rows counted over the middle of caudal peduncle; some specimens have the scales irregular and the midlateral row replaced by rows of very small scales.

Color in alcohol yellowish brown, back darker, and fading to yellowish white on throat and belly; top of snout blackish; a narrow dark brown stripe from nape to dorsal; a broad dark brown band from shoulder to caudal, often with a central black line, above which may be a pale streak; either or both may be lacking; in scales on sides outlined by broad dark marginal bands or rows of dots; a brown streak along base of anal and rows of brown dots on ventral margin of caudal peduncle; fin rays more or less dusky dotted or colorless.

Here described from thirty-six specimens, 53 to 72 millimeters in length, obtained by me in Titunod River, near Kolambugan, Lanao Province, Mindanao. The largest specimens were mature.

I make this disposition of my material with reluctance, as it disagrees with Günther's unsatisfactory diagnosis in several particulars. Günther's specimens had the lateral line 28-29; the origin of the dorsal fin opposite the ninth and tenth scales of the lateral line; the head $4\frac{1}{3}$ times in the length; and the pectoral fin as long as the head. However, it is not probable that my material is more than a geographical race of *R. philippina*.

From *R. argyrotaenia*, as defined by Weber and Beaufort, it differs in proportions of head, depth, eye, interorbital, caudal peduncle, position of dorsal, longer maxillary, and other minor particulars. A large series of specimens from many localities might show the identity of *R. philippina* with *R. argyrotaenia*, but for the present at least they must be considered specifically distinct.

Previously known only from the vicinity of Zamboanga, Mindanao, where it was collected by the Challenger Expedition about 1875, and by Seale in 1908.

In the Bureau of Science collection are six specimens of *Rasbora*, collected in Cagayan River at Cagayan de Misamis, Misamis Province, Mindanao, by Mr. Seale. The specimens, which vary from 30 to 65 millimeters in length, are in wretched condition and badly mutilated, but they probably belong here.

CYPRININÆ

Body oval or more or less elongate, head and body more or less compressed or sometimes depressed, belly not trenchant, rounded, or even flattened in which case the pectorals and ventrals are horizontal; the dorsal may be long or short with from seven to thirty branched rays, and with or without an osseous spine which may be smooth to strongly serrate behind; origin of dorsal before, opposite, or rarely slightly behind that of ventrals; anal short, branched rays five to nine, an osseous spine usually lacking; when present it may be serrated; pectorals and ventrals always well developed; caudal fin forked or emarginate; mouth terminal, inferior, or subinferior, generally small, always protractile; the jaws may have a soft or a horny covering or the lower jaw may have a sharp bony edge; a symphysial knob fitting into a notch on upper jaw is never present; lips may be present or absent; the lower lip may be separated from skin of isthmus by a complete postlabial groove, which is continuous around corner of mouth, or it may be interrupted in the middle, with a separate groove behind each lateral half; scales small to large, with the lateral line running along middle of side of tail in Philippine species; pharyngeal teeth nearly always in three series, rarely in two or in a single row.

This group includes the only members of the Cyprinidæ of commercial or economic importance, and most of the Philippine species belong here.

Key to the Philippine genera of Cyprininæ.

- a*¹. Anal spine serrated behind..... Cyprinus.
- a*². Anal spine not serrated behind.
 - b*¹. Lower jaw spatulate, curved upward, its tip meeting top of snout.
 - Mandibularca.
 - b*². Lower jaw not spatulate, with more or less fleshy lip, not curved in a segment of a circle.
 - c*¹. Mouth terminal, oblique, its posterior margin reaching beyond front margin of eye; two maxillary barbels..... Hampala.
 - c*². Mouth terminal or subinferior, not extending beyond front margin of eye; four barbels in our species.
 - d*¹. Postlabial groove not interrupted in the middle behind chin and continuous around corner of mouth..... Cephalakompsus.

d². Postlabial groove interrupted in middle behind chin but continuous around corner of mouth.

e¹. Lower jaw truncate, reaching but halfway to end of arch of upper jaw..... *Ospatulus*.

e². Lower jaw not truncate..... *Barbodes*.

Genus *CYPRINUS* Linnæus

Cyprinus LINNÆUS, Syst. Nat. ed. 10 1 (1758) 320.

Mouth moderate, terminal, barbels long, four; dorsal very long, its origin opposite to that of ventrals, the last spine bony, stout, and serrated behind; anal short, its origin below posterior half of dorsal, its third spine strongly ossified and serrated behind; scales large, the lateral line complete, running in the middle of tail; gill openings wide, reaching to below hind border of preoperculum, gill membranes broadly attached to the isthmus; pharyngeal teeth, 3, 1, 1-1, 1, 3, broad, truncate, molarlike, with the crown furrowed, flat, or somewhat hollowed.

Large fishes of the fresh waters of Asia and introduced into various parts of the world as food fishes.

Cyprinus carpio Linnæus. Carp.

Cyprinus carpio LINNÆUS, Syst. Nat. ed. 10 1 (1758) 320; GÜNTHER, Cat. Fishes Brit. Mus. 7 (1868) 25.

Dorsal III, 17-22; anal III, 5; pectoral I, 15; ventral I, 7-9; lateral line, 34-40; transverse series, $\frac{5}{5}$.

The body is stout, more or less compressed, heavy anteriorly, color silvery, greenish or gray, without spots or markings. This species, which is a native of China, has been cultivated for many centuries. Consequently there are a great many varieties, with extraordinary differences in form, proportions, squamation, development of fins, and color. Under favorable conditions it attains a length of nearly 1.5 meters and a weight of over 20 kilograms.

Taken to Europe in the twelfth and thirteenth centuries, it is now found in fresh waters all over Europe and the United States; by the Chinese it has been carried to Japan, Hawaii, Java, Sumatra, and other parts of the Orient. Singularly enough, though the Chinese have been coming to the Philippines for more than a thousand years, they do not seem to have established carp here.

In 1915 two thousand carp fry were brought from Hong-kong to Manila at the suggestion of Mr. Alvin Seale. A few were kept in a pond on the grounds of the Bureau of Science,

but most of them were placed in a pond belonging to Dato Piang, at Dulauan, Cotabato Province, Mindanao. A few months later when the Rio Grande de Mindanao was in flood the fish escaped and they are now established in the Pulangi and its tributaries between Dulauan and Fort Pikit.

In 1916 Governor Coverston of Lanao planted fifty-nine carp fry in Lake Dapao and twenty-one in Lake Nunungan. Nothing is known definitely of those placed in Lake Dapao, but those in Lake Nunungan survived and carp are now becoming fairly numerous. In a few more years, fish may be taken from this lake and used to stock the other lakes of the Lanao Plateau.

Carp were taken from Manila and planted in various crater lakes in Luzon, but as there were neither breeding nor feeding grounds for them in those places they perished without reproducing.

While carp are not a first-class food fish, they are much better than anything available in many regions away from the sea. Their introduction into certain rivers of Luzon and Mindanao, if not in some other islands, would be a benefit to the inhabitants in that they would furnish an abundance of cheap food.

Genus *MANDIBULARCA* novum

The somewhat oblong, rather deep body is more or less compressed, strongly so posteriorly, with a broad, rounded ventral surface; the short, broad, blunt snout is without pores or tubercles; the rather small, terminal, slightly oblique mouth has a short protractile upper lip and a thin, elongated, curved, spatula-shaped lower jaw which extends upward around mouth to upper profile of snout; upper lip relatively wide and curtain-like, but lower lip thin and usually altogether absent on tip of mandible; the eyes have a thin, narrow, circular false lid composed of a fold of the outer covering of the eyeball; both rostral and maxillary barbels present; dorsal begins in advance of ventrals, and has a scaly basal sheath; dorsal has four spines, the last one jointed but not serrated, and eight rays; anal has five rays; scales rather large, with longitudinally radiating lines; the lateral line is complete, with simple tubes, and extends down middle of caudal peduncle; gill membranes united to isthmus opposite preoperculum; gill rakers short, seven to fifteen; no pseudobranchiæ; pharyngeal teeth, 5, 3, 2.

This genus is distinguished at once by the elongated, upward-curved and peculiarly shaped lower jaw, from which it is named.

The only species known is found in the Lanao Plateau of Mindanao.

*Mandibularca resinus*² sp. nov. Bagañgan.

Dorsal IV, 8; anal III, 5; ventral I, 8; lateral line, 27 or 28; transverse series, $\frac{4.5}{3.5}$.

The robust body is laterally compressed, especially the posterior half and particularly the caudal peduncle; depth from 3 to $3\frac{1}{2}$ times in length, and head from 3.7 to 4.1 times; back very strongly arched from head to origin of dorsal; sometimes the curve is uniform from tip of snout, but usually it increases markedly at nape; eyes high up, of medium size, 4 to 4.75 times in head and $1\frac{1}{2}$ to 1.4 times in the short, broad, blunt snout; interorbital space wide and flat or nearly so, 1.7 times to twice diameter of eye; mouth terminal, upper lip short and protractile, margined by a relatively wide flap, which continues on to lower jaw but not to its tip; the projecting mandible is drawn out to a narrow, concave, upward-curving, fleshless, more or less spatula-shaped beak; the wide lower part fits over mouth when closed, while the narrower upper part curves over into the space between the premaxillaries and its tip extends almost to or flush with upper profile of snout; the mouth extends less than halfway from tip of snout to eye; a maxillary barbel is behind corner of mouth, a rostral barbel about halfway between it and top of snout; both barbels are of nearly the same size, and vary in length from the diameter of an eye to three-fourths of that length; origin of dorsal opposite eighth scale of lateral line, origin of ventrals behind eighth or opposite ninth; first dorsal spine very small; fourth basally stout, without serrations, and a little more or less than 0.7 the length of head; anal lower than dorsal; ventrals do not reach anus; the pectorals are much shorter than head and do not reach ventrals by two scales; caudal deeply incised, with pointed lobes, and nearly or quite as long as head; there are twelve scales around the much-flattened caudal peduncle, its depth from 2 to 2.3 times in head.

In life the color above is dark olive green, with concolorous dorsal and caudal fins; this merges on sides to an almost golden yellow or the sides are brassy, with the outline of each scale more or less dusky; a vertical dark bar or crescent is more or

² *Resinus*, turned upward.

less evident at base of each scale; belly white; lower half and underside of head often nearly golden yellow; pectorals, ventrals, and anal pale yellow, with more or less hyaline tips.

In alcohol the color is duller, shading from dark green above to golden yellow or whitish below, with a silvery sheen over all; top of snout blackish green; caudal dusky with hyaline tips; the other fins all more or less suffused with yellow or red, with hyaline tips; specimens in alcohol for fifteen years are light brownish to whitish beneath, with a silvery sheen.

On September 11, 1922, I collected seven specimens of this unique fish in the rapids of the Agus, just below Dansalan bridge a short distance from Lake Lanao; three of these were females, nearly ready to spawn. They varied in length from 133 to 176 millimeters; the largest one measured 220 millimeters with the caudal fin. In the collection of the Bureau of Science are three specimens obtained by Chaplain Joseph Clemens in June, 1907, at "Lake Lanao," varying in length from 164 to 178 millimeters. As they were bought in the market it is not possible to say whether they were actually caught in the lake or not.

As far as I know, fishes of this species occur only in the boiling outlet of Lake Lanao, where the Moros catch them with hook and line, but in all probability they also occur in the lake itself. The name *bagañgan* is applied by the Moros to any large, greenish, more or less brassy or golden cyprinid. I therefore look with doubt on the Moro statement that this fish is found in Lake Uyaan.

Genus **HAMPALA** Bleeker

Hampala BLEEKER, Nat. Tijdschr. Ned. Ind. 20 (1859-60) 430.

Body elongate, compressed, with pointed snout; the wide, oblique, terminal mouth extends posteriorly beyond front margin of orbit; upper lip broadened anteriorly, lower one laterally; a postlabial groove parallel with lips but interrupted in middle of lower lip; a barbel behind corner of mouth; dorsal with eight branched rays and a low basal scaly sheath, its origin opposite that of ventrals, its third hard spine feeble and finely serrated; anal with five branched rays; scales large, radiately striate or granulated, sometimes with reticulated lines; lateral line complete, slightly curved ventrally, the tubes simple; gill membranes united to isthmus opposite posterior part of eye; pharyngeal teeth spoon-shaped, 5, 3, 1-1, 3, 5.

Found in fresh water from Borneo to Indo-China and Siam.

Hampala lopezi sp. nov.

Dorsal III, 8; anal III, 5; pectoral I, 14; ventral I, 8; lateral line, 25; transverse line, $\frac{4.5}{2-2.5}$; scales from nape to dorsal, 10; scales between lateral line and base of ventral, 2.5; scales on caudal peduncle, 12; pharyngeal teeth, 5, 3, 1-1, 3, 5.

Dorsal profile of the elongate, compressed body moderately convex; ventral profile uniformly convex from snout to tail; depth 3.4 in length, head 3; eye from 4 to $4\frac{2}{3}$ in head and 1.3 in the blunt snout, which is from 3 to 3.5 times in head and equals the broad flat interorbital space; mouth terminal, very slightly oblique, extending backward just beyond a vertical through front margin of eye; a maxillary barbel behind corner of mouth and nearly or quite equal to eye; upper lip strongly protractile; origin of dorsal behind eighth scale of lateral line and opposite that of ventral; dorsal concave, its third spine slender, weak, and feebly serrate, its height about equal to distance from tip of snout to posterior margin of preopercle, or 1.47 in head; the hard part about 1.7 in total length of spine; pectorals small, their tips not reaching ventral base by width of two scales; ventral not reaching anus by width of one scale; axillary scale of ventral pointed, a third longer than eye; length of caudal peduncle 1.64 to 2 in head, its least depth 1.2 to 1.4 in its length and 2.45 to 2.54 in head; caudal deeply forked, with long pointed lobes; scales with longitudinally radiating lines; pharyngeal teeth small, with curved points, the grinding shoulder comparatively wide.

Color in alcohol silver gray to brownish on sides, the dorsal surface very dark, tip of snout black; paler below, becoming white on belly, and with yellowish glints under head and tail; a broad black band from shoulder to caudal; a dark silver or lead-colored band passing downward from around base of dorsal and connecting with lateral band; a narrow black stripe along upper and lower margins of caudal; rest of fins yellowish or hyaline.

Here described from the type, No. 9186, Bureau of Science collection, and three cotypes, varying in length from 55 to 85 millimeters. They were obtained at Langbuan, Busuanga, by G. A. Lopez, collector of the Bureau of Science, for whom I take pleasure in naming this species. In the two smaller specimens the mouth does not extend back beyond front margin of eye, but this character evidently develops with age, at least in this species.

Genus *CEPHALAKOMPSUS*³ novum

Body oblong, elongate, laterally compressed, with rounded abdomen; head broad, much longer than depth of body, with a stout, clumsy, prominent snout; interorbital space broad, concave, top of snout with a median and two lateral bony protuberances; mouth short but large, subinferior, somewhat horseshoe-shaped, extending about halfway to eye; upper lip strongly protractile, lower lip and jaw included; both lips thick, rugose, with a continuous postlabial groove parallel with lips, passing around corners of mouth and across chin; a pair of rostral and maxillary barbels; preorbital triangular, its point directed forward, suborbital very narrow; the eyes have a very narrow gelatinous rim or lid; dorsal with eight branched rays and a basal scaly sheath, its origin in advance of that of ventrals, its fourth spine rather slender and feebly denticulated; anal with five branched rays; scales rather large, with concentric striae; lateral line complete, descending strongly to below origin of dorsal, then curving upward to a point above anal fin, thence running along middle of caudal peduncle, the sensory tubes simple; gill membranes united to isthmus opposite middle of eye; pharyngeal teeth, 5, 3, 2-1, 2, 4, with pointed, irregular, hooked tips.

This genus is distinguished from related genera by the uninterrupted groove behind lower lip, continuous across chin as well as around corner of mouth, by the lack of sensory folds on head, the rather weak and feebly denticulated dorsal spine, and the large and clumsy head and snout.

The distribution is that of the single species known.

*Cephalakompsus pachycheilus*⁴ sp. nov.

Dorsal IV, 8; anal III, 5; pectoral I, 14; ventral I, 8; lateral line, 26; transverse line, $\frac{4.5}{3.5}$; scales around caudal peduncle. 11; scales between nape and dorsal, 11.

The elongate oblong body laterally compressed, especially on posterior half, its depth 3.86 times in length; the large head a third longer than depth and contained 2.87 times in length; eye high up, posterior margin midway between tip of snout and posterior extremity of head; it is contained 5.2 times in the latter and 1.73 times in the broad, irregular, clumsy snout, the last named 2.23 times in head; the broad, concave interorbital

³ ΚεΦαλή, head; ἄκομπος, uncouth.

⁴ Παχὺς, thick; χείλος, lip.

space nearly 1.5 times eye diameter; the subterminal, curved, subinferior mouth reaches about halfway to eye; the broad, thick, fleshy upper lip strongly protractile and the lower jaw is included, with a continuous groove behind thick lower lip; the stout rostral barbels are a little longer than eye, while the still thicker maxillary barbels are a third longer than eye; the upper profile concave from the bony hump on top of snout to nape, and gently convex from there to beyond dorsal; lower profile strongly convex from chin to caudal peduncle; origin of dorsal opposite posterior part of eighth scale in lateral line, that of ventral opposite ninth scale; fourth dorsal spine rather slender, with weakly serrate posterior margin, and a trifle more than half the length of head, its bony part about 2.8 times in head; pectorals short, extending not quite $\frac{3}{4}$ the distance to ventrals, which equal pectorals in length, their tips separated by the width of one scale from anus; anal low, its height hardly more than $\frac{2}{5}$ that of dorsal; the least height of caudal peduncle contained 1.5 times in its length and 3.25 times in head; caudal deeply forked, with pointed lobes, its length a trifle more than 5 times in that of head and trunk; snout with small epidermal nodules and raised spots.

Color in alcohol nearly uniform brownish yellow, darker dorsally, with indications of a dark band from nape to dorsal fin; snout and interorbital space darkest; all fins pale, dorsal spine and rays slightly dusky.

Here described from the type and only specimen, a spawning female 112 millimeters long, or 134 millimeters over all, collected by me at Dansalan, Lake Lanao, Mindanao, May 5, 1921.

Genus *OSPATULUS*⁵ novum

Body thick, robust, with rounded abdomen, and with the isthmus and underside of head very broad; the rather large subinferior mouth apparently cannot be closed, the truncate lower jaw seemingly having its anterior end cut off so that it reaches but halfway to the extremity of the arch of upper jaw; the thick lower lip laterally produced in a wide flap on each side, thus forming two pocketlike recesses on underside; postlabial groove parallel to lips and continuous around corners of mouth but interrupted at chin; upper lip strongly protractile, lower jaw included; both rostral and maxillary barbels present; interorbital space broad, profile back to nuchal hump nearly straight; dorsal without a basal scaly sheath, or with it feebly

⁵ *O*s, mouth; *patulus*, standing open.

developed, its origin in advance of ventral, its longest spine slender and feebly denticulated; lateral line complete, little curved, with simple tubules; gill membranes attached immediately behind posterior extremity of eye; scales rather large with both longitudinally radiating and concentric striæ.

This genus is strongly differentiated by the shape of its lower jaw, lip, and mouth. It is known only from Lake Lanao, Mindanao.

Key to the Philippine species of Ospatulus.

- α^1 . Dorsal spines III; scales on caudal peduncle, twelve; head 3.6 in length *O. truncatulus*.
 α^2 . Dorsal spines IV; scales on caudal peduncle, ten; head 2.7 in length. *O. palaemophagus*.

Ospatulus truncatulus ⁶ sp. nov.

Dorsal III, 8; anal III, 5; pectoral I, 13; ventral I, 8; lateral line, 26; transverse line, $\frac{4.5}{3}$; scales on caudal peduncle, 12; scales between nape and dorsal, 11; pharyngeal teeth, 4, 2, 2-2, 2, 4.

Body thick and robust, upper profile marked by a very decided hump behind nape, after which there is a very slight upward curve to dorsal; depth contained 3.17 times in length and greater than the short, rather blunt head, which is contained 3.6 times in length; top of head wide, nearly flat, sloping in a nearly straight line from tip of snout to nape; eyes very high, 4.28 times in head and 1.5 times in snout; interorbital space greater than the blunt snout, which is contained 2.85 times in head; mouth terminal but apparently inferior, oblique, upper jaw strongly protractile, with upper lip of medium thickness, much broader at corners of mouth than at middle of lip; mouth seems to be open even when closed, as the truncate lower jaw is very short, extending but halfway from angle of the two jaws to anterior extremity of mouth; two broad fleshy flaps form lateral pockets on underside of lower lip; the slender rostral barbels more than an eye diameter in length; the stouter maxillary barbels more than one and a half times an eye diameter; origin of dorsal opposite ninth scale; the slender third dorsal spine two-thirds the length of head, and half again as long as the minutely serrated bony part; pectoral less than 0.8 the distance to ventral and fails to reach latter by the width of two scales; origin of ventral opposite tenth scale of lateral line, from which it is separated by 3.5 scales; ventrals are

⁶ *Truncatulus*, from the truncate form of the lower jaw.

$\frac{1}{11}$ the length of pectoral and lack half a scale of reaching anus; anal low, its height a trifle more than the hard part of dorsal spine and more than twice in head; caudal peduncle rather long, its least depth 2.5 times in its length, which is two-thirds that of head; caudal fin deeply forked, with pointed lobes, and equals head in length; lateral line slightly curved, but does not ascend to middle of side until fifth scale from posterior end; pharyngeal teeth more or less crooked, only one in outer row large, and with some but partially developed.

General color in alcohol yellowish brown, dusky on dorsal half, much paler below; top of head and region in front of dorsal darkest; fins all pale, except dorsal which is slightly dusky.

The type of the species and genus is a ripe male, Bureau of Science collection No. 9190, which I obtained at Dansalan, Lake Lanao, in May, 1921. It was with *Barbodes katolo*, which it resembles in general outline.

Ospatulus palaemophagus ⁷ sp. nov.

Dorsal IV, 8; anal III, 5; pectoral I, 14; ventral I, 8; lateral line, 26; transverse line, $\frac{4.5}{2.5}$; scales on caudal peduncle, 10; scales between nape and dorsal, 10; pharyngeal teeth, 4, 3, 2-2, 3, 4.

The stout oblong body laterally compressed, its depth 3.38 times in length; head very large and contained 2.7 times in length, the opercular flap extending beyond base of pectorals; top of head nearly flat and horizontal; dorsal profile with a nuchal hump of moderate height, followed by a low flat curve; ventral profile much more strongly convex; interorbital space contained 1.3 times in the blunt snout, which is one-third the length of head; a prominent bump on upper surface of anterior end of snout; eye high, and contained 4.75 times in head and $1\frac{3}{8}$ times in snout; mouth large, terminal, slightly oblique, lower jaw included, with protractile and rather thin upper lip; lower jaw much as in *O. truncatulus* but with the lip and flaps beneath it thinner; rostral barbels a little shorter than an eye diameter, maxillary barbels a fourth longer than an eye diameter, all the barbels approximately equal in thickness; origin of dorsal opposite seventh lateral-line scale, that of ventral opposite eighth scale; the moderately stout dorsal spine a trifle more than half the length of head, and nearly half again as long as the feebly

⁷ Πάλαϊμφον, Palaemon, a sea god, and the name of a genus of shrimps; Φαγος, eating.

serrate hard part; length of pectoral 0.8 the distance to base of ventral, and reaches within 1.5 scales of latter; origin of ventral separated by 2.5 scales from lateral line; ventrals four-fifths as long as pectorals and fail to reach anus by the width of two scales; anal low, its height a little more than the hard part of fourth dorsal spine; caudal peduncle rather short, its depth 3.16 times in head and 0.75 of its length, which is 0.42 of head; caudal fin forked, lobes wide, and a trifle more than 0.7 as long as head; lateral line gently curved until sixth scale from posterior end, when it proceeds along middle of side.

Color in alcohol dark yellowish brown, becoming blackish on top of head and snout and blackish brown along dorsal region; a dark opercular spot; fins all pale except dorsal, which has the spines and rays darker.

Here described from the type and only specimen, No. 9200, Bureau of Science collection, a male 105 millimeters long, with a length over all of 128 millimeters, collected by me at Lumbatan, a town on the south shore of Lake Lanao. It was mixed with a number of other cyprinids of the same general outline and color. In the mouth and throat was a fresh-water shrimp, *Palaemon* sp., which it had evidently been in the act of swallowing when captured.

Genus **BARBODES** Bleeker

Barbodes BLEEKER, Conspectus Systematis Cyprinorum, Nat. Tijdschr. Ned. Ind. 20 (1859) 431.

Body oblong elongate, compressed, with short and usually blunt snout; minute pores present on top of snout and head in some of our species; pearly epidermal spots or tubercles often present during the breeding season; mouth terminal or somewhat inferior and more or less oblique, with a more or less protractile upper jaw; lips smooth and generally thin, with a postlabial groove which is interrupted in middle of lower jaw behind chin; a rostral and a maxillary pair of barbels always present; dorsal with seven to nine branched rays and three or four spines and a more or less developed scaly sheath at its base; last dorsal spine enlarged, most of its length bony, and nearly smooth to very strongly serrate behind; anal with five to seven branched rays and three weak spines; scales large to medium in size, smooth and cycloid, or with longitudinally radiating and often much-branched lines, or both; lateral line complete, more or less curved downward, running along middle of caudal peduncle,

at least posteriorly, the sensory tubes simple; gill membranes united to isthmus opposite preopercle or hind part of eye; pharyngeal teeth, 5 or 4, 4 or 3, 3, 2, or 1-1, 2, or 3, 3 or 4, 4 or 5.

Generally distributed in southeastern Asia and from Borneo to the Philippines, with one widespread species occurring as far eastward as Lomok.

Key to the Philippine species of Barbodes.

- a*¹. Eight scales from nape to dorsal.
 - b*¹. Dorsal spines III; scales on caudal peduncle thirteen or fourteen; axillary scale equal to or one-seventh more than eye. *B. hemictenus*.
 - b*². Dorsal spines IV.
 - c*¹. Scales on caudal peduncle twelve; axillary scale 1.5 times to twice eye *B. ivis*.
 - c*². Scales on caudal peduncle eleven, rarely twelve; axillary scale much less than eye..... *B. tumba*.
- a*². Eight to nine scales from nape to dorsal.
 - d*¹. Four large dark spots, often with dark bar along middle of side; usually dark spot at base of dorsal and often at base of anal; dorsal spines IV.
 - e*¹. Thirteen to fourteen scales on caudal peduncle.
 - B. quinquemaculatus*.
 - e*². Twelve scales on caudal peduncle.
 - f*¹. Head 3.4 to 3.8 in length; transverse series scales $\frac{4.5}{2.5-3}$; dorsal spine serrate..... *B. binotatus*.
 - f*². Head 4.5 in length; transverse series scales $\frac{5}{2.5}$; dorsal spine smooth..... *B. montanoi*.
 - d*². No dark spots or band on side; dorsal spines III; scales on caudal peduncle eleven..... *B. clemensi*.
- a*³. Nine scales from nape to dorsal.
 - g*¹. Eleven scales on caudal peduncle.
 - h*¹. Twenty-two to twenty-four scales in lateral line, rarely twenty-five or twenty-six; dorsal spines IV; a dark silver band from shoulder to caudal..... *B. amara*.
 - h*². Twenty-four to twenty-nine scales in lateral line; no spots or dark band on sides; dorsal spines III..... *B. flavifuscus*.
 - g*². Twelve to thirteen scales on caudal peduncle; twenty-seven to twenty-eight scales in lateral line; four large dark spots and broad dark bar on side..... *B. manguaoensis*.
- a*⁴. Nine to ten scales from nape to dorsal.
 - i*¹. Twenty-four to twenty-six scales in lateral line; four large dark spots and dark bar along side; dark spot at base of dorsal.
 - B. bantolensis*.
 - i*². Twenty-eight scales in lateral line; no dark spots or bar on side.
 - B. lanaoensis*.

a^5 . Eleven scales from nape to dorsal.

j^1 . Scales on caudal peduncle eleven; transverse series $\frac{4.5}{3}$ **B. katolo.**

j^2 . Scales on caudal peduncle thirteen; transverse series $\frac{6}{4}$.. **B. manalak.**

a^6 . Eleven to fifteen scales from nape to dorsal.

k^1 . Dorsal spines III; dark stripe from shoulder to caudal; head not laterally compressed beneath..... **B. lindog.**

k^2 . Dorsal spines IV; no dark stripe on side; ventral half of head strongly compressed laterally..... **B. palata.**

Barbodes hemictenus Jordan and Richardson.

Barbodes hemictenus JORDAN and RICHARDSON, Bull. U. S. Bur. Fisheries 27 (1907) 241, fig. 5.

Dorsal III, 8; anal III, 5; pectoral I, 15; ventral I, 8; lateral line, 24, 25, or 26; transverse line, $\frac{4.5}{2.5}$ or $\frac{4.5}{3}$; scales from nape to dorsal, 8, rarely 9; scales on caudal peduncle, 13 or 14; scales between origin of ventral and lateral line, 2.5; pharyngeal teeth, 2, 3, 4 or 5-5 or 4, 3, 2, their tips slightly hooked.

The relatively full, rounded oblong body differs in form from that of all closely related species, being proportionately thicker and less compressed, only the caudal peduncle being much flattened; predorsal region elevated, but lacking the rather sharp median ridge of *B. tumba*; dorsal profile uniformly and moderately convex from tip of snout to origin of dorsal; abdomen noticeably full and rounded; depth from 2.75 to 3.1 times in length; head narrower than trunk, rather small, its length 3 to 3.8 times in length and about $1\frac{1}{3}$ times in depth of trunk; the eyes have a narrow circular gelatinous lid, are high up, 3.14 to 3.7 in head and 1.3 to 1.7 in the broad, gently rounded inter-orbital space; the short rounded snout equals eye in length or is a seventh longer; mouth rather small, slightly oblique, upper lip protractile, lower jaw included, lips as in *B. tumba*; the short maxillary scarcely extends posteriorly to eye; barbels of moderate thickness, rostral extending to pupil of eye or beyond, maxillary nearly to or even beyond posterior margin of preopercle; origin of dorsal opposite posterior part of or behind eighth scale of lateral line; it is usually nearer base of caudal than tip of snout and is opposite or slightly behind origin of ventral; third dorsal spine slender or of moderate strength, its length equal to or 1.2 in that of head; its hard part weakly serrate along its upper half, 0.8 or more than 0.8 as long as the entire spine and approximately equal to height of anal;

pectorals broad and relatively short, 1.3 in head, their tips not reaching base of ventrals by the breadth of a scale; ventrals short, 1.5 in head, not reaching anus by the width of one or two scales; ventral axillary scale pointed, its length equaling that of snout; caudal peduncle short, its length 1.5 to 1.75 times in head, its least depth 0.8 to more than 0.9 its length; caudal fin broadly and deeply forked; in a few cases there are nine scales before dorsal; in one specimen, 90 millimeters long, there were but twelve scales on the caudal peduncle; with a lens the top of the head is seen to be covered usually with minute pores.

Color in alcohol of dorsal region and top of head blackish, merging to dark olive brown on sides, underparts paler or yellowish; a broad black band extends from shoulder to base of caudal peduncle; a large, more or less circular black spot on middle of side of caudal peduncle, just before caudal fin; a more or less evident blackish blotch on each side of forward part of dorsal fin base; a line of minute specks forms a dark margin to scales on sides; fin rays more or less faintly dusky. The markings are well shown in Jordan and Richardson's excellent figure.

Here described from one hundred twenty-two specimens collected by Prof. A. L. Day, in Sabaan River, near Lake Naujan, Mindoro. They range in size from 25 to 100 millimeters, and all agree in essential characters and color, the latter being different at all stages from that of other species of the same size. Eleven specimens, varying from 76 to 100 millimeters in length, were females which were ready to spawn or which had already spawned. Males in spawning condition and specimens without any visible development of the sexual organs all had the same characteristic form of the abdomen.

I have also examined six specimens, from 46 to 72 millimeters in length, collected by A. L. Day from Mamboc River, a tributary of Lake Naujan, Mindoro.

The distinct species, originally described from Baco River, on the north coast of Mindoro, is thus far known only from the northeastern part of this little-explored island.

***Barbodes ivis* (Seale).**

Barbus ivis SEALE, Philip. Journ. Sci. § A 4 (1909) 494, pl. 1.

Dorsal IV, 8; anal III, 5; pectoral I, 15; ventral I, 7; lateral line, 23 to 25, usually 24; transverse line, $\frac{4.5}{3}$; scales from

nape to dorsal, 8; scales on caudal peduncle, 12; scales between base of ventral and lateral line, 2.5; pharyngeal teeth, 5, 3, 2, or 3, 5, 3, 2-2, 3, 5, 3, or 2, 3, 5.

Body much elevated, laterally compressed, tapering toward the wedgelike dorsal side, caudal peduncle very wide and much compressed laterally; dorsal profile nearly straight from tip of snout to dorsal fin, or more or less convex, with a small hump at nape; depth 2.1 to 2.6 in length; head small, pointed, 3.5 to 3.8, its depth about 1.5 times in its length; eye 3.6 to 4 in head, 1.5 to 1.6 in the broad, flat, or nearly flat interorbital space; snout broad, rather pointed, with blunt rounded tip, equal to or a fifth longer than eye; mouth small, subterminal, slightly oblique with included lower jaw, posterior extremity of maxillary beneath nostrils; lips rather thin, upper lip strongly protractile; barbels rather slender, long, the upper extending to anterior margin or to center of eye, the lower sometimes beyond posterior margin of preopercle; origin of dorsal behind eighth or opposite to or behind ninth scale of lateral line, that of ventral behind seventh or opposite eighth scale; fourth dorsal spine stout, its height equal to or more than three-fourths the length of head; the hard part is noticeably and rather strongly serrate except on its basal portion, its height a little more or less than four-fifths of dorsal; pectorals $1\frac{1}{4}$ to $1\frac{1}{3}$ in head, their tips failing to reach ventrals by the breadth of a scale or more; ventrals variable, 1.2 to 1.6 in head, their tips extending beyond anus or failing to reach it by the breadth of a scale; the long, sharp-pointed ventral axillary scale from one and a half times to nearly twice eye; the width of the broad flat caudal peduncle usually equal to its length or may be contained in it 1.25 times, its length contained from 1.3 to 1.6 in head; caudal deeply and broadly notched, upper lobe narrower; scales with longitudinally radiating lines.

Color in alcohol silvery gray, or in specimens many years in preservative silvery brown; dark or dusky above, paler on sides and becoming white on abdomen; a dark spot on nape; a large circular blackish spot on side of caudal peduncle, in advance of caudal fin; traces of one or two dark spots along median lateral line and one below anterior part of base of dorsal; lower side of caudal peduncle more or less yellow, the color extending upward across caudal peduncle behind the black caudal spot; traces of a broad dark silver bar more or less evident from shoulder to caudal spot; fins all colorless, rays more or less dusky, or in young specimens tips of dorsal, anal, and caudal

dusky to black. In some specimens the scales of dorsal half have traces of a bluish or violet reflection.

Here described from the type specimen, 100 millimeters long, collected by Seale at Balabac; from a specimen, 96 millimeters long, collected by Seale at Paracan, Palawan; and from five specimens, 91 to 110 millimeters long, collected at Concepcion, Busuanga Island, by G. A. Lopez, in 1922. I have also examined three specimens, from 68 to 77 millimeters in length, collected at Langbuan, Busuanga Island, and eighteen specimens, 35 to 68 millimeters long, from Concepcion, Busuanga Island, all obtained by Lopez in September, 1922. I have also seen eighty-nine cotypes, 33 to 96 millimeters in length, collected by Seale at Balabac, and four specimens, 56 to 70 millimeters in length, collected by Seale at Malampaya Sound, Palawan.

This species is distinct in appearance and readily separable at all stages from any other Philippine species. Thus far it is known only from Balabac, Palawan, and Busuanga.

Barbodes tumba ⁸ sp. nov.

Dorsal IV, 8; anal III, 5; pectoral I, 15 or 14; ventral I, 7; lateral line, 24 to 26; transverse line, $\frac{4.5}{2.5}$ or $\frac{4.5}{2}$; scales from nape to dorsal, 8; scales on caudal peduncle, 11, or 12 on small specimens; scales between origin of ventral and lateral line, 2 or 2.5.

The deep robust body elevated dorsally, with a more or less evident sharp median ridge from nape to dorsal, head and anterior part thick and heavy, with rounded abdomen and posterior half strongly compressed laterally; depth from 2.5 to 3.6 times in length, the broad blunt head from 2.8 to 3.75 times; a circular gelatinous lid to the eyes, which are high up, their posterior margin midway between tip of snout and posterior margin of operculum, or in the anterior portion of head; eyes 3.5 to 4.5 in head and 1.4 to 1.8 times in the broad, flat, or gently rounded interorbital space; snout usually broadly rounded, rarely somewhat triangular, blunt, and equal to or occasionally a third longer than eye; the rather small mouth terminal, moderately oblique, lower jaw included; maxillary short, not extending posteriorly as far as margin of eye; upper lip thin, protractile; underside of lower lip has a broad but thin lateral

⁸ *Tumba* is a Marinao or Lanao Moro name for several species of Cyprinidæ.

fold on each side; there is no symphysial knob on underside of lower jaw; barbels usually stout and long, rostral extending from anterior portion to posterior margin of eye; the maxillary barbels may extend to posterior margin of preopercle or beyond; origin of dorsal midway of length or slightly anterior, and behind to seventh lateral-line scale; origin of ventral behind eighth, or sometimes opposite dorsal; fourth dorsal spine of medium stoutness or rather slender, weakly to moderately serrated, its height 1.3 to 1.75 in head; the hard part is from two-thirds to three-fourths of its total height; pectorals long, 1.3 to 1.5 in head, their tips separated by the breadth of one scale from or extending to base of ventrals; the latter from 1.5 to 1.85 in head and extending to within a scale or less than half a scale of anus; axillary ventral scale short, rounded, much less than eye in length; anal nearly as high as dorsal, extending over two-thirds or more of the length of caudal peduncle when depressed; length of caudal peduncle 1.4 to 1.8 in head, its least depth nearly equal to or 1.5 in its length and 1.7 to 2.4 in head; caudal fin broadly notched, its length a fourth or more of head and body; upper lobe usually narrower and more pointed; scales from nape to dorsal usually eight, sometimes seven, and in a few cases by the intercalation of small scales they number nine or ten; scales with conspicuous longitudinal branching lines; a row of pores continues from lateral line, passing forward above and around eye; with a lens the top of the head is seen to be covered with many minute pores; pharyngeal teeth, 5, 3, 2-2, 3, 5.

The general color in life is dark greenish or olive above, paler on sides, and white or with a golden tinge on the underparts, a silvery luster over all; a dark lateral band and dark spots described below more or less evident.

The general color in alcohol is dark silvery; top of head and dorsal region very dark brown or blackish brown, becoming paler on sides and merging into white on chin and belly; sometimes sides of head and underparts are more or less golden; specimens from clear cold mountain streams often have the scales with a violet-blue luster; each scale usually with a dark vertical bar posteriorly; a dark or bluish black band from shoulder to caudal is more or less evident; a large blackish blotch near middle of side of caudal; a spot or bar on each side, below anterior part of dorsal; often there are two dark spots on middle of side below or behind dorsal; the rays of the

lips are more or less darkened; fins more or less dusky; a large black spot is often present on nape; the whole body, except the underparts, is thickly sprinkled with minute dark specks. This species varies in color, scale counts, and proportions so that it is sometimes difficult to determine specimens satisfactorily. The dorsal profile may form a bold convex curve from tip of snout to dorsal, or the top of the head may be nearly straight, with an upward curve from nape to dorsal; the ventral profile is uniformly convex from chin to caudal peduncle.

Here described from thirty-nine specimens obtained in Siwagat River, a stream in the mountains east of Lake Lanao; one hundred seventy-six specimens from Lake Uyaan; forty-seven from Lake Nununġan; and thirty-four from the outlet of Lake Dapao. These specimens vary from 24 to 128 millimeters in length and were all collected in the highlands of Lanao Province, Mindanao, in September, 1922. None was in spawning condition, though some females 100 millimeters and upward in length had either spawned or else had the ovaries filled with immature eggs.

The distribution of this species is very interesting. Lake Uyaan is a small, oval, apparently crater lake, a few miles west of the southwest corner of Lake Lanao and several hundred feet higher in altitude. It has no apparent outlet, but is said to have an outlet in the bottom, the water emerging as a spring at Ganassi. Lake Nununġan lies about 24 kilometers southwest of Lake Lanao, and is entirely surrounded by lofty, nearly vertical mountains except on the northeast, where a creek flows into it. The lake is more than 1.5 kilometers in diameter, and a chain of hills lies across the place where one would expect to find a river flowing toward the sea; but there is a subterranean outlet at the foot of a great rocky hill, and one can see the tumba playing in and out of the cavernous passage into which the water flows on its way under the mountain, emerging on the other side four or five hours' travel distant. In both these lakes there are other fish; dalag, carried there by man beyond question, are not rare, and in Lake Nununġan carp planted in 1916 are now increasing rapidly. Now and then an eel is taken in Nununġan, and the Moros claim that *baganġan*, a large cyprinid, occurs in Lake Uyaan, though this is doubtful.

Lake Dapao is several kilometers long, and was undoubtedly formed by the damming of a river valley. The outlet is a clear, cold, swift stream, in which tumba are exceedingly abun-

dant, several hundred specimens having been obtained at a single shot. The lake lies several kilometers southwest of Ganassi, a town on Lake Lanao, at a somewhat lower altitude, and drains into Mataling River, which reaches the sea near Malabang, on the southern coast of Lanao Province. All of these lakes with outlets are cut off from the lowlands by waterfalls impassable to ordinary fish.

Siwagat River is a small, clear, cold stream with gravel bottom, in the mountains, about 19 kilometers east of Tamparan, a village on the eastern shore of Lake Lanao. No other fish ascends the river to this point, though at the foot of the mountains several species of fishes, cyprinids, eels, and dalag, occur.

From the closely related species, *Barbodes quinque maculatus*, this species may be separated by the more anterior position of the dorsal, the broader, blunter snout, the fewer scales on the caudal peduncle, and the shorter, more-rounded ventral axillary scale.

***Barbodes quinque maculatus* (Seale and Bean).**

Barbus quinque maculatus SEALE and BEAN, Proc. U. S. Nat. Mus. 33 (1907) 229, fig. 1.

Dorsal IV, 8; anal III, 5; pectoral I, 15; ventral I, 7, or sometimes 8; lateral line, 24, sometimes 25; transverse line, $\frac{4.5}{2.5}$ or $\frac{4.5}{3}$; scales from nape to dorsal, 8, rarely 9; scales on caudal peduncle usually, 13; scales between origin of ventral and lateral line, 2.5 or 3.

Body deep, moderately robust, predorsal region elevated, posterior half much compressed, preanal region deep and narrow; depth 2.6 to 2.9 in length, head 3.5 to 3.6; eyes from 3.8 to 4 times in head, and 1.5 to 1.6 times in the broad interorbital space, which is flat or nearly so, and is contained 2 to 2.5 times in head; snout rather narrow and pointed with broadly rounded tip, and as long as or an eighth longer than eyes; mouth terminal, oblique, lower jaw included, maxillary hardly extending to anterior margin of eye; barbels slender to moderately stout, rostral a fourth longer, maxillary barbel a half longer than eye, origin of dorsal opposite to or behind eighth scale of lateral line, and opposite to or behind origin of ventral, which is behind seventh or opposite eighth scale; fourth dorsal spine of moderate strength, its height 1.1 to 1.3 in length of head; the hard portion weakly to moderately serrate along its upper half, its height 1.3 to 1.4

in that of fin or 1.6 to 1.8 in head; pectorals very long, 1.1 to 1.25 in head, their tips reaching ventrals; ventrals also long, 1.2 to 1.35 in head, nearly or quite reaching anus, the pointed axillary ventral scale 1.5 times as long as eye; caudal peduncle wide and flat, its length 1.5 to 1.6 times in head, its least depth 1.1 to 1.25 times in its length; scales on caudal peduncle mostly thirteen, sometimes fourteen; pharyngeal teeth 5, 3, 2-2, 3, 5, their tips hooked; scales with longitudinally radiating lines.

Color in alcohol greenish, or more often pale brownish with a silvery luster, with dorsal region dark brown, becoming lighter on sides and pale on belly and throat; scales with more or less evident dark margins; a large dark spot on side near base of caudal; in a few small specimens there are two black spots on median lateral line, one below and one behind dorsal, a black blotch below base of dorsal and a dark streak at origin of lateral line; fins all pale or dorsal rays brownish.

Here described from seventeen specimens collected by Alvin Seale at the type locality, near Zamboanga, Mindanao, and varying from 52 to 122 millimeters in length. Seale and Bean say "D., 11; A., 7;" but this is evidently an error. Farther on they state "Second ray of dorsal ossified and strong," but second should be changed to fourth. Though small, the first and second spines are plainly evident. •

In life the color is stated by Seale to have been—

silvery with opalescent bronze reflections, scales above and on upper part of sides with greenish wash, more distinct on base of [dorsal?] fin; there is a slightly darker area at base of dorsal; head is bronzy greenish olive above; iris golden; a few specimens have the dusky area at base of dorsal forming a more or less distinct spot; a single black spot at base of caudal peduncle.

This species is very close to *B. binotatus*, from which however it differs in several details, particularly in shape, in the number of scales on the caudal peduncle, in the greater length of the ventral axillary scale, and in the feebler serration of the dorsal spine.

I have recently received six specimens from a stream flowing into Caldera Bay, near Zamboanga, which are from 50 to 97 millimeters in length; also eight specimens from Basilan, 56 to 100 millimeters long. The last named, preserved in formalin, are dusky above, paler below with a nearly white belly and a yellowish cast over all; the top of the head and on back to the dorsal fin blackish; greenish bronze reflections over the entire body.

Barbodes binotatus Cuvier and Valenciennes.

Barbodes binotatus CUVIER and VALENCIENNES, Hist. Nat. Poiss. 16 (1842) 168.

Puntius (*Barbodes*) *maculatus* BLEEKER, Atlas Ichth. 3 (1863) 104, pl. 134, fig. 1; pl. 141, fig. 1; and pl. 144, fig. 6.

Barbus maculatus GÜNTHER, Cat. Fishes Brit. Mus. 7 (1868) 123.

Barbus palawanensis BOULENGER, Ann. & Mag. Nat. Hist. VI 15 (1895) 186.

Puntius binotatus WEBER and BEAUFORT, Fishes Indo-Austr. Arch. 3 (1916) 186, fig. 74.

Dorsal IV, 8; anal III, 5; pectoral I, 14–15; ventral I, 8; lateral line, 22–25; transverse line, $\frac{4.5}{2.5}$ or 3; scales from nape to dorsal, 8–9; scales on caudal peduncle, 12; scales between ventral and lateral line 2.5, rarely 3.

Depth from 2.6 to 3 in length, head 3.4 to 3.8; eye 3.5 to 3.9 in head; 1.5 to 1.7 in the broad, gently convex interorbital; snout pointed, with broad, rounded tip, equal to or a seventh longer than eye; mouth terminal, not large, slightly oblique, lower jaw included, maxillary usually extending only to a point beneath nostrils; rostral barbel reaches eye or to middle of pupil; maxillary barbel extends beyond eye or even beyond posterior margin of preopercle; origin of dorsal opposite or behind eighth scale of lateral line, that of ventral behind seventh or eighth scale; fourth dorsal spine slender or of medium stoutness, its upper half noticeably serrate, its height about 1.3 in head, its hard portion about 1.5 times in dorsal height; pectorals 1.3 in head and may reach ventrals or may fall short by the width of a scale; ventrals nearly as long, 1.4 in head, and do not reach anus by the width of one or two scales; their pointed axillary scale as long as or longer than an eye diameter; least height of caudal peduncle 1.1 to 1.3 times in its length, which is 1.5 to 1.8 in head; scales of lateral line usually number twenty-four; other characters as in *B. quinquemaculatus*.

In life the color varies from silvery gray to greenish gray, darker or even blackish green above, paler or nearly white on throat and belly; the following dark or blackish markings are usually present; a large, nearly circular spot on side near base of caudal; a bar just behind operculum on shoulder; two spots between shoulder and caudal, one opposite origin of dorsal, the other opposite origin of anal; occasionally a third spot is added to this row; a large spot or bar at base of anterior dorsal rays; a more or less distinct spot, or traces of one, at anterior part

of base of anal. Sometimes there is a dark longitudinal line or even a broad band from shoulder to base of caudal; any or all of the markings may be absent, especially on the larger specimens, except the caudal spot, which seems to be always present.

Color in alcohol similar, but usually considerably darker; often olive brown above and brown or yellowish brown below, with the markings all very distinct.

Here described from many specimens, all from the following localities in Mindanao: At Lake Buluan, Cotabato Province, in October, 1922, I obtained eleven specimens, ranging in length from 38 to 110 millimeters, five of them females with rather well developed eggs. At Ugalingan Piang's landing on the Pulangi, near Fort Reina Regente, I collected thirty specimens in October, 1922; this lot includes one male and one female, each 67 millimeters long, and nearly ready to spawn, and one female, 53 millimeters long, with eggs just beginning to develop; the remainder range in size down to 20 millimeters. Two females, 118 and 97 millimeters, respectively, each with immature eggs, were obtained by me in October, 1922, in a creek at Kidapauan, Cotabato Province; three others collected at the same time were much smaller, the smallest being 21 millimeters in length. Ten specimens, varying in length from 28 to 50 millimeters, were obtained by me in October, 1922, at Kamansa, Davao Province, in a small brook tributary to Saug River.

At the Allen ranch near Cagayan de Misamis, April 20, 1921, I collected twenty specimens from 21 to 50 millimeters in length; in Balongkott Creek, near Linabo, Bukidnon Subprovince, April 23, 1921, twenty-two specimens from 23 to 74 millimeters in length; in Malupali River, at Mailag, Bukidnon Subprovince, April 25, 1921, fifteen specimens, 15 to 67 millimeters in length; in Tagualmay creek on the Fader ranch near Santa Fé, Bukidnon Subprovince, May 2, 1921, seven specimens, from 18 to 63 millimeters in length; from Titunod River near Kolambugan, Lanao Province, forty-five specimens, from 17 to 88 millimeters in length.

Eight specimens, from 30 to 50 millimeters in length, were collected by Alvin Seale in Cagayan River at Cagayan de Misamis in 1908; and one hundred eleven specimens, ranging from 16 to 64 millimeters in length, were collected by Seale and Canonizado at Talacogon, on Agusan River, Agusan Province, in September, 1907.

The specimens from Misamis, Bukidnon, and Lanao differ in color and general form from those collected in other parts of

Mindanao, but it is not likely that they are more than a geographical race.

The dorsal profile is uniformly convex from the tip of the snout to the dorsal; the dorsal spine is not so coarse as shown in Bleeker's figure; the scales on the caudal peduncle seem to be never more nor less than twelve. In young and very small specimens the depth is proportionately less and the head may be equal to the depth, with larger eyes and other juvenile characters.

In the collection of the Bureau of Science are seven specimens, 38 to 78 millimeters in length, collected by Mr. Seale at Puerto Princesa, Palawan, and determined by him as *B. palawanensis* Boulenger. Weber and Beaufort, who have examined the type specimen in the British Museum, consider it a color variety of *B. binotatus*. As these specimens agree in all essentials except the number of pharyngeal teeth, which are 3, 5, 3, 2-2, 3, 5, 3, we may call them *Barbodes binotatus* var. *palawanensis* (Boulenger). A large series of small specimens, many of them spawning, collected at Taytay, Palawan, in May, 1913, also seem to belong to this variety.

I have recently obtained twenty-four specimens, 39 to 96 millimeters long, from Busay River, Basilan, and forty-five specimens, 39 to 107 millimeters long, from Balactasan River, Basilan. With the last mentioned was also collected a very large female in breeding condition, with a length of 167 millimeters, or 213 millimeters over all. The characteristic spots were absent but there can be no doubt that this bulky specimen belongs here. The Basilan specimens were obtained in August, 1923, by G. A. Lopez, fish collector of the Bureau of Science. In Malum River, Tawitawi, Mr. Lopez also caught three specimens, 79, 106, and 162 millimeters in length.

This species seems to be general over the lowlands of Mindanao, and in Basilan, and extends into Palawan. Outside the Philippines it occurs from Sumatra and Singapore to Borneo and Lombok, inclusive.

Barbodes montanoi (Sauvage).

Puntios montanoi SAUVAGE, Bull. Soc. Philomat. 7, 5 (1881) 103.

Dorsal, 11; anal, 7; lateral line, 26; transverse line, $\frac{5}{2.5}$.

Four barbels, the inferior one longer than the superior. Third ray of dorsal bony, smooth, nearly as high as length of head,

not including snout. Height of body contained 3.5 times in length of head, 4.5 times in total length; body compressed; profile between dorsal and tip of snout inclined; snout obtuse, without pores, as long as eye, of which the diameter is included, 3.5 times in length of head and 1.5 times in width of interorbital space, lips thick. Two series of scales between lateral line and origin of ventrals. Dorsal inserted an equal distance from end of snout and origin of caudal, which is forked; ventrals a little nearer origin of pectoral than that of anal. Brown on back; four large black spots along lateral line, uniting in an obscure band. Length 90 millimeters.

Simulao River (center of Mindanao), *Montano*.

I have not seen this species, and the above description is translated from Sauvage. Simulao River is a tributary of the Agusan, flowing in from the southeast of Agusan Province, and on which Bunauan is located. Montano, the celebrated French traveler, passed through here in December, 1880.

Barbodes montanoi is evidently very close to *B. binotatus*, but without an examination of the type I do not feel justified in reducing it to the synonymy. If Sauvage is right in saying that the bony dorsal ray is smooth, it is certainly distinct from the other cyprinids known from the lowlands of Mindanao.

Barbodes clemensi sp. nov.

Dorsal IV, 8; anal III, 5; pectoral I, 15; ventral I, 7; lateral line, 22-24; transverse line, $\frac{5}{2.5}$; 11 scales around the caudal peduncle; scales from nape to dorsal, 8 or 9; pharyngeal teeth, 5, 3, 2-2, 3, 5.

The thick robust body is little compressed, with broad, rounded belly; depth from 3 to 3.3 times in length; head usually a little less than but sometimes equal to depth, and from 3.1 to 3.6 times length; snout short, broad, with a prominent median tubercle, or protuberance, which marks posterior limit of the protractile upper lip, and is contained from 3.16 to 4 times in head; eyes high up, 1.6 to 1.8 times in snout, 1.5 to 2.1 in the broad, gently rounded or nearly flat interorbital space and 6.1 in head; mouth terminal, moderate in size, slightly oblique, 4.2 to 4.66 times in head; the short lower jaw is usually included and is comparatively narrow, its basal width 4.2 to 5 times in head; rostral barbels equal to or slightly longer than diameter of eye; maxillary barbels a little longer than rostral pair; origin of dorsal

opposite seventh scale of lateral line; the free margin of fin slightly concave; fourth dorsal spine stout, feebly serrated along upper half of the bony portion which is contained 2.1 to 2.2 times in head; the entire spine from 1.4 to 1.6 times in head; origin of ventrals, which do not reach anus, is opposite eighth scale of lateral line, from which they are separated by one or one and a half rows of scales; pectoral broad, long, 1.3 in head, its tip in the type specimen reaching base of ventral, which is more than 1.8 in head; caudal deeply forked, with pointed lobes, its length 0.8 to 0.88 of head; least height of caudal peduncle from 1.45 to 1.7 in its own length, which is contained 2.2 to 2.7 times in head; lateral line rather faint, descending abruptly from its origin to a point opposite origin of dorsal fin, after which it pursues nearly a straight course along middle of tail; in large specimens the upper profile is a nearly uniform convex curve from tip of snout to origin of dorsal; some smaller specimens have the top of the head flattened, with a marked hump behind nape, behind which profile is gently convex to dorsal; belly profile is a uniform, strongly convex curve from chin to anal fin, the greatest depth being opposite origin of dorsal.

Color in alcohol dusky above, gradually fading on sides to lighter and becoming yellowish or pale flesh color beneath; top of head darkest, or nearly black; fins colorless, concolorous, or dorsal and caudal slightly dusky; specimens in alcohol for sixteen years are nearly uniform brownish with a brassy luster.

Fresh specimens are dark green above, merging into yellow beneath, with golden or brassy luster on sides and belly; fins colorless or reddish.

This fine cyprinid is easily distinguished from the closely related species *Barbodes manalak* by the larger scales and their consequent lesser number, the smaller mouth and lower jaw, and the thick, coarse dorsal spine.

The species is here described from the type specimen, No. 10159, Bureau of Science collection, 188 millimeters long, having a total length of 235 millimeters, obtained by me at Dansalan, Lake Lanao, in May, 1921, and three cotypes, 116 to 137 millimeters long. I have also examined five cotypes, obtained by Joseph Clemens at Lake Lanao in June, 1907, varying in length from 114 to 190 millimeters.

I take pleasure in naming this for my friend Chaplain Joseph Clemens, who with his wife made the first scientific collections around Lake Lanao.

***Barbodes amara* sp. nov.**

Dorsal IV, 8; anal III, 5; pectoral I, 14; ventral I, 8; lateral line, 22 to 24; transverse line, $\frac{4.5}{2.5}$ or $\frac{4}{2}$; scales from nape to origin of dorsal, 9; scales on caudal peduncle, 11; scales between lateral line and origin of ventral, 2.5 or 2.

The oblong body is rather elevated and much compressed, especially the posterior half, with narrow and little-rounded abdomen; the depth usually equals or may be a trifle more or less than head, 3.12 to 3.6 times in length; eye high up, from 3.14 to 4 times in head and as long or almost as long as the rather pointed snout, the upper surface of which is marked by a median hump and two smaller lateral ones on each side; the flat interorbital space has a low median ridge and is a little wider than the length of snout or eye; mouth terminal, very oblique, posterior margin of maxillary not reaching eye; upper lip thin, very protractile; lower jaw weak, slightly included, even, or somewhat projecting, with a thin lip and a small knob projecting from outer side of symphysis; rostral barbels slender, their length usually much less than, rarely equal to, diameter of eye; maxillary barbels somewhat larger, their length varying from a little less to a little more than diameter of eye; the free or lower edge of the bones of the mandible and the suboperculum curves downward under chin to meet the bones of the other side below eye, leaving only a narrow oval portion free behind chin; upper profile straight from snout to nape, then moderately convex to the region behind dorsal; lower profile uniformly convex from throat to anal; dorsal with a well-developed scaly basal sheath; origin of dorsal nearer tip of snout than base of caudal fin, origin of both dorsal and ventral opposite eighth scale of lateral line; fourth dorsal spine contained from 1.4 to 1.66 times in head, its upper half feebly to moderately toothed, its hard portion 2 to 2.25 times in head; pectorals long, about 1.5 in head, nearly or quite reaching ventrals, which in turn extend to and are 1.7 to 1.8 in head; anal lower than pectoral, its height not much greater than the hard part of dorsal spine; least height of caudal peduncle is 1.35 to 1.5 times in its own length and 2.4 to 2.5 times in head; caudal deeply forked, with pointed lobes, its length 0.8 to 0.9 of head; in one specimen the lateral line has twenty-five tubes on one side, twenty-six on the other; pharyngeal teeth 5, 3, 2-2, 3, 5, their crooked tips hooked; scales with conspicuous longitudinally radiating lines.

Color in alcohol brownish above, merging into yellowish or whitish on sides and belly, with a silvery luster over all; a dark silver band extends from shoulder to middle of caudal; there is a more or less evident blackish band from nape to dorsal fin and top of head is dark also; the fin rays are more or less dusky; lips and tip of snout edged with black; the outlines of each scale above lateral line marked out by a band of very minute black specks.

Here described from the type, No. 9167, and fourteen cotypes in the Bureau of Science collection, all obtained by me at Dansalan, Lake Lanao, Mindanao, September 11, 1922, and varying in length from 66 to 92 millimeters. The largest specimen, which has a length over all of 108 millimeters, is a female filled with immature eggs, as are likewise the smallest specimen and two others of the lot. The only other female had already spawned.

Another lot of fifteen specimens, obtained at the same time and varying in length from 36 to 64 millimeters, contains no sexually mature individuals. Some of this lot have as many as twenty-five or twenty-six scales in the lateral line; those in a transverse series are $\frac{4}{2}$, with two scales between the origin of the ventral and the lateral lines.

I also place here a collection of twenty-five specimens labeled Lake Lanao, July 7, 1910. They are all small, varying from 29 to 80 millimeters in length, most of them being about 40 millimeters long. The largest is a spent female. In this lot the scale count is usually from twenty-four to twenty-six.

The Moro name is *pait*, a word common to many Filipino languages and meaning bitter. The flesh of most of the smaller East Indian Cyprinidæ is bitter, and in Mindanao, outside of Lanao, all cyprinids are known as *pait*.

Barbodes flavifuscus ⁹ sp. nov.

Dorsal III, 8; anal III, 5; pectoral I, 15; ventral I, 7; transverse line, $\frac{4.5}{3}$; scales on caudal peduncle, 11; scales between nape and dorsal, 9.

Body elongate oblong, dorsal profile low with a decided hump behind nape; depth from 3 to 3.6 times, the long head 2.87 to 3 times in length; posterior margin of eye midway of length of head, or in anterior half; eye from 4.28 to 4.56 times in head

⁹ *Flavus*, yellow; *fuscus*, dusky.

and 1.2 to 1.3 in snout; top of head straight or slightly dished, snout elevated, with a central hump and two smaller lateral ones; interorbital space about equals snout, which is 3.3 to 3.4 times in head; mouth large, terminal, little oblique, lips thick, lower jaw included; barbels larger than in *B. katolo*, rostral nearly reaching eye or even extending nearly to pupil; maxillary reaches pupil or may extend beyond posterior margin of eye; third dorsal spine rather stout, feebly dentate, about half as long as head, its hard part 0.8 of its total height; the pectorals are short, 1.7 to 1.8 in head, and do not reach origin of ventrals by the breadth of two scales, while the ventrals are also short, 2 to 2.25 in head, and do not reach vent by two scales; length of caudal peduncle from 2 to 2.1 times in head, and its least depth 0.64 to 0.66, or 1.5 to 1.6 times in its length.

The color of fresh specimens was very dark blackish brown; the color in alcohol is bluish black on snout and top of head and blackish brown dorsally, becoming paler brown on sides and yellowish brown on belly; fins are all dusky.

Here described from a male, the type, 105 millimeters long, No. 9164, Bureau of Science collection, and two cotypes, each 89 millimeters long, obtained by me at Lumbatan, Lake Lanao, in May, 1921; one of the cotypes is a female.

These fish resemble *B. katolo* in appearance and in the characters not otherwise here specified. This species can be distinguished from *B. katolo* by the shorter pectorals and ventrals, the fewer scales between the dorsal and the head, and the coloration. The larger specimen has twenty-four scales in the lateral line on one side, twenty-eight on the other side; the female specimen has twenty-eight on one side, twenty-nine on the other; the other specimen has twenty-four.

It is known as *katapa-tapa* by the Moros at Lumbatan.

***Barbodes manguaoensis* (A. L. Day).**

Barbus manguaoensis DAY, Philip. Journ. Sci. § D 9 (1914) 189, pl. 1, fig. 3.

Dorsal IV, 8; anal III, 8; pectoral I, 15; ventral I, 8; lateral line, 27, rarely 28; transverse line, $\frac{4.5}{3-3.5}$; scales between lateral line and base of ventrals, 2.5 to 3.5; scales from nape to dorsal, 9; scales on caudal peduncle, 12 to 13; pharyngeal teeth, 3, 5, 3, 2-2, 3, 5, 3.

Body thick, with broad rounded abdomen, elevated, dorsal profile straight from tip of snout to nape, where there is a

distinct hump, then strongly convex to dorsal fin; base of dorsal with a high scaly sheath; depth 2.75 to 3.6 in length; head 3.24 to 4; eye 3.5 to $4\frac{1}{4}$ times in head, 1.27 to 1.5 times in the broad snout, and 1.3 to 1.7 in interorbital space, which is 2 to 3.2 in head; mouth very oblique, lower jaw included; rostral barbel equals or slightly exceeds eye, maxillary barbel from 0.1 to $\frac{2}{7}$ longer than rostral barbel or eye; origin of dorsal opposite tenth scale of lateral line, fourth spine very broad and strong, moderately serrate, low, but broken so that its height is not accurately determinable; according to Day's figure, about 1.75 in head; pectoral broad, rounded, 1.5 to 1.6 in head, not reaching ventral by the width of two scales; ventral 1.66 to 1.8 in head, not reaching anus by the width of two scales, its origin opposite or behind ninth scale of lateral line; axillary scale 1.3 to 1.4 times diameter of eye, broad, with pointed tip; anal low, 1.75 to 2.18 in head; length of caudal peduncle 1.25 to 1.6 in head, its least depth 1.47 to 1.5 in its length; caudal fin badly damaged.

Color in alcohol faded yellowish brown, darker above; four black spots on side, the largest and most distinct one on lateral line on side of caudal peduncle and before base of caudal fin, the remaining three above lateral line, one above origin of anal, one above origin of ventral, and an elongated area above anterior portion of pectoral, all connected by an indistinct broad black band.

Here described from the type, 94 millimeters long, and a cotype 140 millimeters long, in the possession of Prof. A. L. Day, of the University of the Philippines. Four dorsal spines are plainly evident, not three as given in the original diagnosis.

Thus far this species is known only from Lake Manguao, near Taytay in northern Palawan, where it was collected in 1913 by a joint expedition from the Bureau of Science and the University of the Philippines. It is said to be abundant, biting freely at baited hooks and even nibbling at fingers held in the water. Lake Manguao is a very lonely, seldom-visited sheet of water, briefly described in Professor Day's paper cited above.

Barbodes bantolensis (A. L. Day).

Barbus bantolensis A. L. DAY, Philip. Journ. Sci. § D 9 (1914) 188, pl. 1, figs. 1 and 2.

Dorsal IV, 8; anal III, 5; pectoral I, 14; ventral I, 7; lateral line, 24 to 26; transverse line, $\frac{4.5}{2.5}$; scales between lateral line

and origin of ventral, 2.5 or 3; scales on caudal peduncle, 12; pharyngeal teeth, 3, 5, 3, 2-2, 3, 5, 3.

The form of the body varies very markedly even in specimens of the same length, but is more or less oblong elongate, usually elevated dorsally, with a decided hump at the nape, or the upper profile strongly convex; lower profile nearly straight or little arched; body and caudal peduncle thick, only moderately compressed laterally; depth 2.55 to 3.2 in length, head 2.7 to 3.26; eye 4.2 to 5.1 in head, 1.4 to 1.7 in the broad, bluntly rounded snout, and 1.4 to 1.9 in the wide, flat, or nearly flat interorbital space; mouth large, terminal, moderately oblique, upper lip projecting slightly beyond included lower lip; rostral barbel stout, $\frac{1}{3}$ longer than eye and reaching its anterior margin; maxillary barbel stronger but not much longer, $1\frac{3}{8}$ times eye and extending to middle of eye; origin of dorsal opposite ninth or eighth scale of lateral line, and much nearer caudal than tip of snout; scaly sheath at base of dorsal only moderately developed; fourth spine strong, its height 1.6 to 1.85 in head, the osseous part strongly serrate nearly to its base, its height 1.3 in that of dorsal or 2.3 to 2.7 in head; pectoral rather long, pointed, 1.6 to 1.8 in head, not reaching base of ventral by the width of one or two scales; origin of ventral opposite seventh or eighth scale of lateral line; ventral rather long, its tip not reaching anus by one scale, 1.8 to 1.9 in head, axillary scale $\frac{1}{9}$ to $\frac{1}{7}$ longer than eye; anal low, 2.3 to 2.7 in head; caudal fin damaged, broadly forked.

Color in alcohol brownish yellow, dusky above, paler below, to very pale yellowish on belly; a dark spot on nape with a more or less evident dark stripe from nape to caudal; an indistinct dark lateral band from shoulder to caudal; a very large dark spot or bar across caudal peduncle near base of caudal fin; a dark elongate blotch behind shoulder; a large dark spot between origin of dorsal and ventral and another circular one between it and caudal spot; fins unmarked; some specimens show dark spot along base of dorsal.

Here described from ten specimens, one of them the type of the species, from 55 to 124 millimeters in length, collected at Lake Manguao, near Taytay, in northern Palawan, as noted under the description of *B. manguaoensis*.

Four dorsal spines are plainly evident, not three as stated in the original description.

Barbodes lanaoensis sp. nov.

Dorsal IV, 8; anal III; pectoral I, 14; ventral I, 8; lateral line, 28; transverse line, $\frac{4.5}{3}$; scales on caudal peduncle, 12; scales between nape and dorsal, 9 or 10.

Body compressed, elevated, dorsal and ventral profiles about equally arched and belly and underside of head broadly rounded; from dorsal to tip of snout may be a straight line, or there may be a slight concavity at nape; depth from 3 to 3.5 times, head from 3.2 to 3.5 times in length; eyes very high, their upper margin flush with profile, and contained 3.5 to 4.3 times in head; posterior margin nearer tip of snout than to posterior edge of operculum; snout rather narrow, blunt, its length equal to an eye diameter or exceeding it by a half; interorbital space equals snout; mouth terminal, oblique, lips of moderate thickness, upper one protractile; barbels much longer than in the related species; rostral barbel longer than eye, extending to pupil or beyond eye; maxillary barbel longer than or twice as long as eye, extending to posterior margin of preopercle or beyond; origin of dorsal nearer tip of snout than root of caudal fin and behind seventh scale of lateral line; outer margin of dorsal concave, fourth dorsal spine from $\frac{3}{8}$ to $\frac{5}{7}$ as long as head, its hard part broad, serrated along its upper half, and $\frac{3}{4}$ as long as dorsal height; pectorals long, 1.35 in head, nearly or quite reaching origin of ventral; origin of ventral behind eighth scale of lateral line, from which it is separated by 2.5 scales; tip of ventrals, which are 1.8 in head, fails to reach anus by the width of a scale or less; anal about half as high as dorsal, its posterior rays reaching hardly half the length of caudal peduncle; length of caudal peduncle contained 1.5 to 1.75 times in head, its least depth 1.4 to 1.6 times in its length; the deeply forked caudal fin a little less than a fourth the length of head and body, its lobes more or less pointed.

The lateral line is curved strongly beneath the dorsal, not reaching a median position until about the fifth scale from the caudal; scales of the lateral line mostly twenty-eight, but twenty-six or twenty-seven in some specimens.

Color in alcohol brownish yellow, upper half darkened, paler below and more or less yellow on belly; anterior dorsal region and top of head dark brown; fins all pale; in some specimens there is a faint dark spot on caudal peduncle, and a faint dark bar on shoulder.

Here described from eight female specimens, varying in length from 78 to 95 millimeters, the largest one 118 millimeters over all. They were all ready to spawn except the smallest one, which had already spawned and had a very few mature eggs left in the ovaries. The specimens were obtained by me at Dansalan, Lake Lanao, May 5, 1921. I also refer here a mature male, collected at the same time and place, and having a length of 94 millimeters; while it does not agree in some particulars, having shorter pectorals and ventrals, it agrees in other essentials. In September, 1922, I obtained two immature males at Dansalan, which were 72 and 75 millimeters, respectively.

The name *kandar* is apparently used by the Moros not only for this species, but also for *B. palata* and other species smaller and less desirable in quality than *B. lindog*.

Barbodes katolo sp. nov.

Dorsal IV, 8; anal III, 5; pectoral I, 15; ventral I, 8; lateral line, 26; transverse line, $\frac{4.5}{3}$; scales on caudal peduncle, 11; scales between nape and dorsal, 11.

Body elongate oblong, moderately compressed, with dorsal profile rather low and about equal in convexity to ventral profile, or with a pronounced nuchal hump; depth from 3.3 to 3.7 times in length; the thick, clumsy head very long, and contained 2.7 in length; eye very high up, its hind margin halfway between tip of snout and posterior extremity of head; it is contained from 4.5 to 5 times in head and 1.5 times in snout; top of head broad, flat, or slightly dished centrally, inter-orbital space greater than an eye diameter but not equaling the long, broad, blunt snout, which is 3 times in head; on top of end of snout is a large irregular hump; mouth rather large, terminal, oblique, with included lower jaw; upper lip protractile and moderately thick; lower lip thicker, with lateral flaplike extensions on underside, much as in *Cephalakompsus* and *Ospatulus*; barbels rather weak, short, rostral one equal to half or three-fourths of an eye diameter and not reaching eye; maxillary barbel reaches pupil and is from three-fourths to an eye diameter in length; origin of dorsal nearer caudal than tip of snout and opposite posterior margin of eighth scale of lateral line; outer margin of dorsal straight or slightly concave; fourth spine of medium size, weakly serrate, and half as long as head, its hard part three-fourths of dorsal height; pectorals 1.8 to

1.9 in head, reaching origin of ventrals; origin of latter opposite ninth scale of lateral line, from which it is separated by 2.5 scales; ventrals long, 2.1 to 2.2 in head, their tips reaching within one-half scale of anus; anal moderate, its height about three-fourths of dorsal; length of caudal peduncle contained 2.5 times in head; its depth 0.78 to 0.87 of its length; caudal fin broadly and deeply notched, upper lobe narrower and more pointed, its length a little less than one-fourth that of head and body.

Color in alcohol yellowish brown, dorsal region slightly dusky and top of head brown; fins all pale.

Here described from the type, No. 9161, Bureau of Science collection, 110 millimeters long, and two cotypes, 101 and 95 millimeters long, the smallest one a female. They were obtained by me at Dansalan, Lake Lanao, May 5, 1921; the Moros call them *katolo*.

This fish strongly resembles *Cephalakompsus pachycheilus* but lacks the continuous postlabial groove across the chin; also, the lips are thinner and not rugose, and the barbels are smaller, while the pectorals and ventrals are much longer in proportion.

Barbodes manalak sp. nov.

Dorsal IV, 8; anal III, 5; pectoral I, 15; ventral I, 7 or 8; lateral line, 24–26; transverse line, $\frac{6}{4}$; scales around the caudal peduncle, 13; scales from nape to dorsal, 11; pharyngeal teeth, 5, 3, 2–2, 3, 5, all more or less hooked at the tip, except that in some specimens the largest teeth may have their tips worn off so that their shape is that of a truncate cylinder.

The deep, robust, oblong body, with very broad and rounded belly, is but little flattened laterally, and the caudal peduncle only moderately so; the depth is equal to the length of the large broad head, and contained from 2.95 to 3.3 times in length of head and body; eyes very high up, prominent, 1.4 to 2 times in snout, 1.8 to 2 times in interorbital space, and 5 to 6 times in head; dorsal profile straight or nearly so from tip of snout to nape where it is more or less strongly elevated; thence it is a low gentle curve to origin of dorsal; interorbital space broad, gently curved from side to side, or flat; in the latter case a median bony ridge is evident; snout wide, short, without prominent protuberances, and contained from 3 to 3.6 times in head; mouth wide, oblique, subterminal, its length 3.4 to 3.7 times in head;

lower jaw strong, broad, rounded, and prominent, more or less projecting, its basal width 3.1 to 3.6 in head; upper lip moderately protractile; rostral and maxillary barbels short, their length varying from the diameter of an eye to half that length; dorsal truncate or nearly so, its origin opposite middle of eighth scale of lateral line, fourth dorsal spine smooth or nearly so and comparatively slender, its length 1.8 to 2 times in head, the length of the stiff portion a little more or less than 3 (2.8 to 3.3) times in head; pectorals 1.45 to 1.55 in head, their tips nearly touching base of ventrals or separated therefrom by half the width of a scale or more; the broad ventrals are 2 to 2.2 in head and do not reach anus by the width of a scale; their origin is behind eighth scale of lateral line and separated therefrom by 2.5 rows of scales; anal truncate, its height equal to or a fourth less than that of dorsal; caudal deeply forked, with pointed lobes, its length from nearly two-thirds to nearly 0.9 the length of head; the least height of caudal peduncle from 2.66 to 2.9 times in its own length, the latter 1.5 to 1.7 times in head; lateral line conspicuous, gently curved toward belly in its forward half.

Color in alcohol dark, nearly black along dorsal surface, becoming paler on sides, and merging into yellowish or golden gray or lighter on belly and throat; interorbital space, snout, muzzle, and opercle blackish; interorbital space, snout, suborbital, and opercle covered with pearly epidermal spots; dorsal fin dusky anteriorly and above and caudal also dusky; the other fins are all pale.

Fresh specimens have the dorsal surface dark green, changing to pale or whitish on sides and overcast with brassy or golden, especially on belly; pectoral and upper angle of dorsal dusky; the rest of the fins pale or with a roseate flush; top of head and snout blackish, with pearly epidermal spots, and also on the suborbital and opercle.

This large and handsome cyprinid is here described from three specimens collected by me in May, 1921, at Dansalan, Lake Lanao, and one specimen collected in June, 1907, by Chaplain Joseph Clemens. The type, No. 9998, has a length of 240 millimeters, or 315 millimeters over all; the cotypes vary in length from 182 to 236 millimeters.

The Moros capture this species in Lake Lanao with gill nets. Though large, this fish is not especially prized for food. The name *manalak* seems to be applied to the two largest species of Cyprinidæ of Lake Lanao.

Barbodes lindog sp. nov.

Dorsal III, 8; anal III, 5; pectoral I, 15; ventral I, 8; lateral line, 28–32; transverse line, $\frac{5.5}{3.5}$; scales on caudal peduncle, 12; scales between nape and dorsal, 11–13.

Body elongate, oblong, thick, not much compressed, dorsal profile evenly convex from snout to caudal peduncle, forming a low flat curve, ventral profile more convex than upper, with full rounded belly, the paired fins short and far apart; depth 3.75 to 4.54 times in length; head equal to depth, or it may be slightly greater, 3.7 to 4.16 in length; eye very high up or it may have the upper margin flush with profile, equal to or slightly greater than the somewhat blunt and round-tipped snout, 3.5 to 4 times in head, with a well-developed gelatinous eyelid, broadest anteriorly; interorbital rather flat, 1.1 to 1.5 more than eye; mouth rather small, terminal, oblique, lower jaw included with upper lip strongly protractile, and thin, continuous lips; rostral barbels very small, their length less than half the diameter of eye; maxillary barbels stouter, equal to or but little greater in length than rostral barbels, never equal to eye; the free margin of dorsal slightly concave, the slender spine smooth or very slightly serrate, its height two-thirds or less the length of head, the stiff portion less than half the length of head; origin of dorsal midway or nearer tip of snout than base of caudal and behind tenth scale of lateral line; ventrals short, 1.8 to 2 in head, reaching halfway to origin of anal, their origin opposite eleventh scale of lateral line, from which they are separated by 3 scales; pectorals short, a little more or less than 1.6 in head; the deeply forked caudal has pointed lobes and is nearly as long as head; lateral line nearly straight; it curves slightly downward to below dorsal, then runs along middle of body to tail; pharyngeal teeth 5, 3, 1, or 4, 3, 1; scales with concentric striæ.

Color in alcohol dusky above, merging into pale or yellowish on sides and belly; a dark stripe along middle of back from nape to caudal fin and a similar band from upper side of operculum to middle of caudal fin; fins all colorless, or with a slight dusky tinge to caudal and dorsal spines.

Here described from sixteen female specimens, ready to spawn or just through spawning, and one ripe male, collected at Dansalan, Lake Lanao, Mindanao. This fish, called *lindog* by the Moros, is caught among the pond weeds of the shallow

bays of the lake in enormous quantities. For catching this and other cyprinids the Moros use fine-meshed gill nets. It is the most important fish of Lake Lanao and, next to one called *bau-u-lan*, is their most-prized cyprinid.

My specimens were collected May 4, 1921, and range in length from 100 to 107 millimeters; the longest one is 132 millimeters in length, including the caudal fin.

The ripe females have the body greatly distended both ventrally and (especially) laterally, by the very numerous large eggs.

I have also examined seven females, all ready to spawn, and one ripe male, collected by Chaplain Joseph Clemens at Lake Lanao in June, 1907. In these specimens, which have been in alcohol sixteen years, the stripe has faded and the specimens are dark above, with pale or whitish sides and belly and a brassy luster over all.

Barbodes palata sp. nov.

Dorsal IV, 8; anal III, 5; pectoral I, 14; ventral I, 8; lateral line, 28-32; transverse line, $\frac{5}{8.5}$; scales on caudal peduncle, 12; scales between nape and dorsal, 11-15; pharyngeal teeth, 5, 3, 2-2, 3, 5, all small and crooked.

Body elongated, not much compressed except caudal portion and the narrow, pointed head; ventral profile much more convex than dorsal; depth contained from 3.57 to more than 4 times in length; length of head slightly greater, ranging from $3\frac{1}{2}$ to 3.75 times in length; the large circular eyes very high up, flush or nearly flush with upper profile, and equal to the narrow compressed snout, 3.75 to 4 times in head; interorbital space equal to or may be a very little more or less than eye, and nearly flat; profile from snout to dorsal may form a regular convex curve, or it may be straight to nape, with a more or less pronounced hump behind nape and the remaining dorsal profile nearly flat to caudal; mouth terminal, strongly oblique, with weak jaws, the lower one stronger and projecting, with a knob on the protruding symphysial angle; upper lip thin, lower lip about twice as broad, postlabial groove continuous except at symphysis of lower jaw; ventral part of head noticeably compressed, forming a sharp angle from tip of chin back to breast, but with round belly and caudal peduncle; barbels very short and weak, maxillary ones larger than the rostral, but rarely exceeding half of eye in length; origin of dorsal opposite back part of eighth or

ninth or behind ninth scale of lateral line, the rather slender to moderately stout fourth dorsal spine contained 1.5 to 1.7 times in head; its stiff portion serrated along upper half or two-thirds, and contained 1.4 to 1.5 times in height of dorsal; pectorals long, 1.3 to 1.5 in head, tip separated by one scale or less from base of ventral; origin of ventral opposite or a little in advance of dorsal, and separated by 2.5 scales from lateral line; ventral rather short, $1\frac{2}{3}$ to 1.75 in head, not reaching anus by 2.5 scales; anal low, its height less than two-thirds that of dorsal; caudal peduncle rather long, its length 0.64 to 0.72 that of head; its least depth contained 1.66 to 1.9 times in its length and 2.5 to 2.85 times in head; caudal fin deeply forked, with pointed lobes, its length almost or quite equaling depth; lateral line but slightly curved; scales marked by concentric striæ, those on upper half of body also having longitudinal striæ.

Color in alcohol nearly uniform light brownish yellow, becoming more or less shaded with dusky dorsally or on dorsal half; a narrow dusky band from nape to dorsal and back to caudal; a blackish irregular spot often visible on operculum; lips and tip of lower jaw black; fins pale or pectorals, dorsal, and caudal margined with dusky or with dusky rays.

Here described from five females ready to spawn, and five males, varying in length from 97 to 112 millimeters, the longest one 140 millimeters including the caudal fin. They were obtained at Dansalan, Lake Lanao, May 5, 1921.

I have also examined nine nearly ripe females, varying in length from 80 to more than 90 millimeters, one female 96 millimeters long, with the ovaries filled with minute, little-developed eggs, and 7 males from 78 to 94 millimeters long, all collected by me at Dansaian, Lanao, September 18, 1922.

Palata is the Marinao word for narrow, and is applied to this fish by the Moros because of the pinched narrow head, especially along its ventral side.

ILLUSTRATIONS

PLATE 1

Mandibularca resinus sp. nov.

PLATE 2

FIG. 1. *Ospatulus truncatulus* sp. nov.

2. *Cephalakompsus pachycheilus* sp. nov.; $\times 1$.

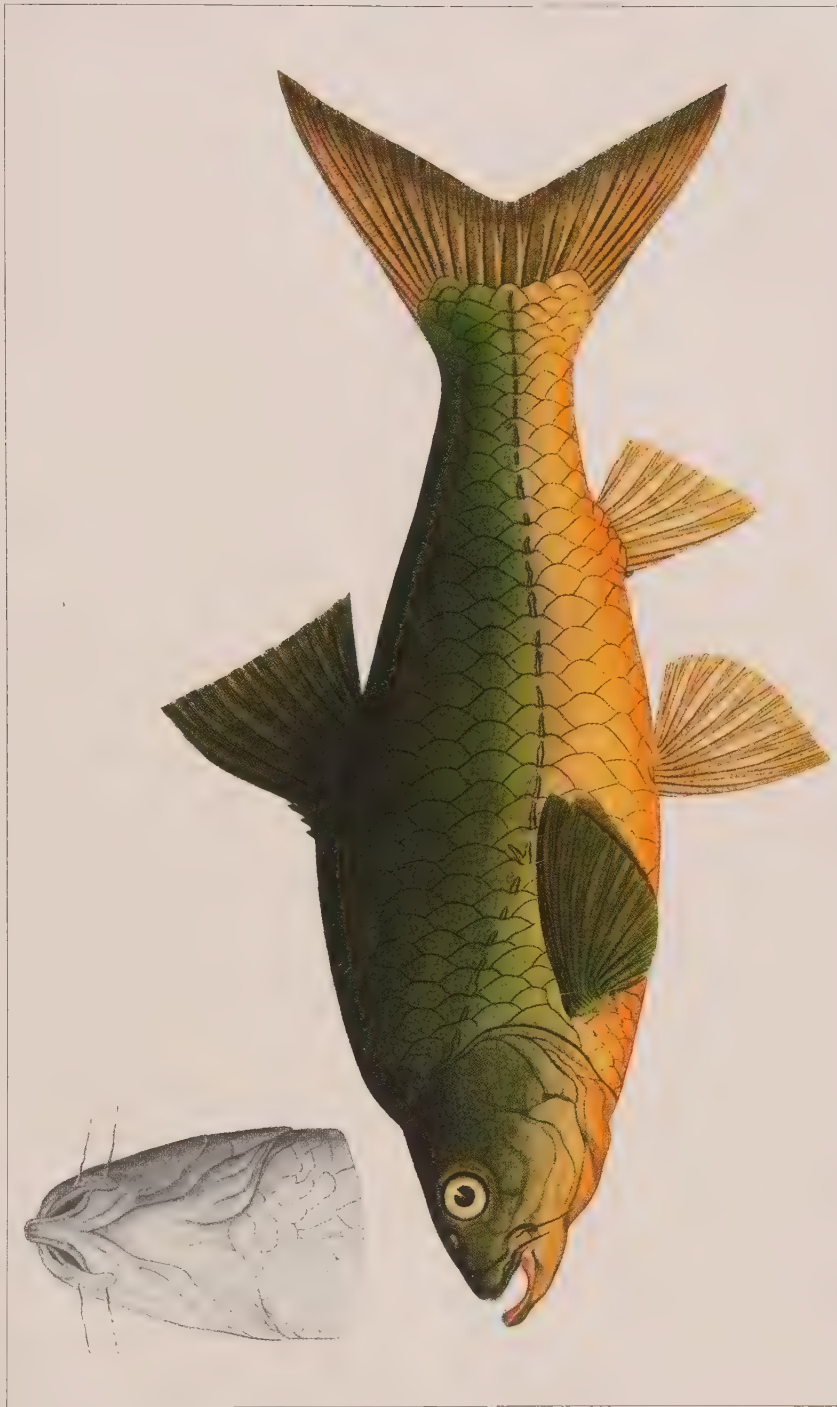


PLATE 1. MANDIBULARCA RESINUS SP. NOV.

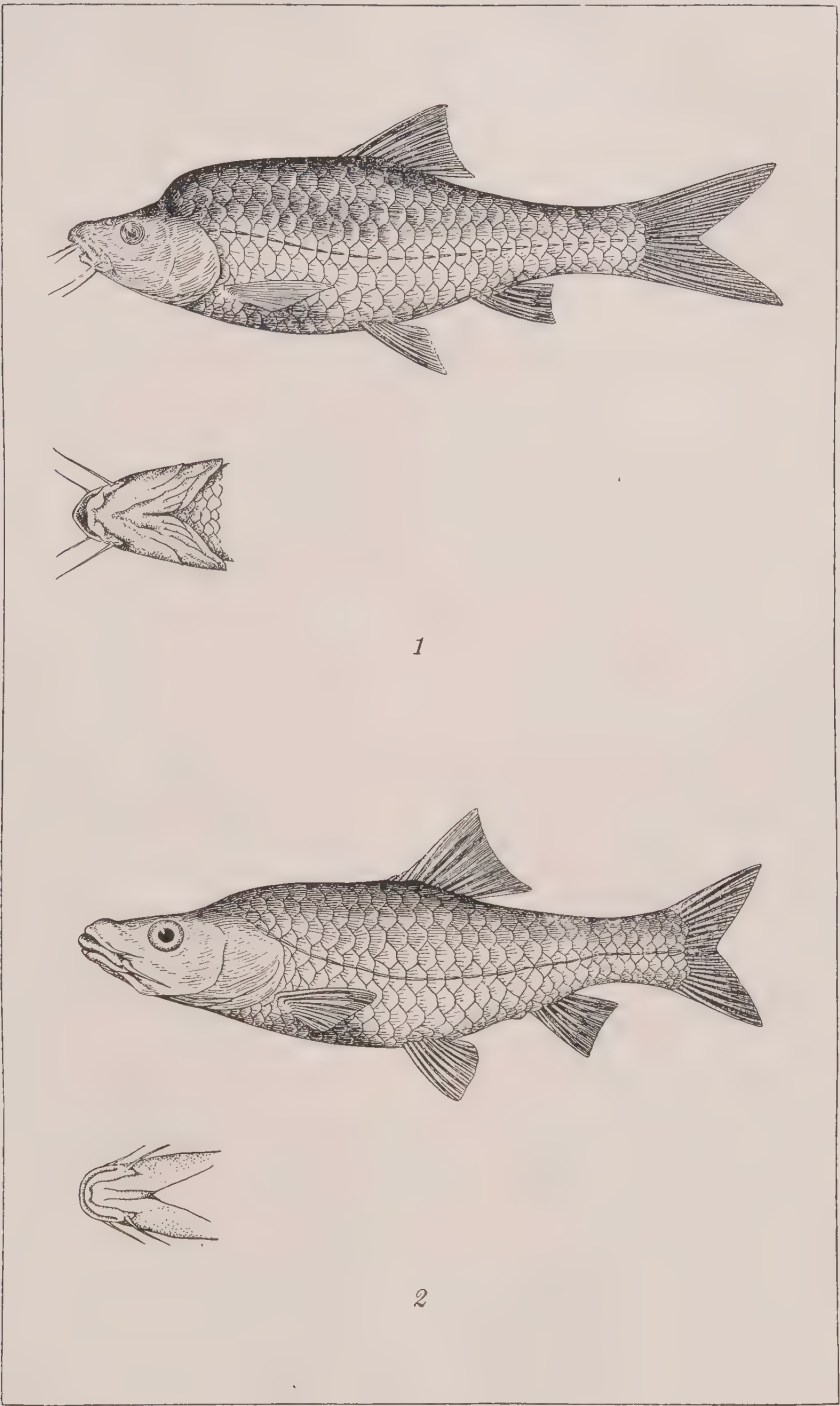


PLATE 2.

A MONOGRAPH OF THE PACHYRRHYNCHID GROUP OF THE BRACHYDERINÆ, CURCULIONIDÆ: PART I

THE GENUS PACHYRRHYNCHUS GERMAR ¹

By W. SCHULTZE

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(Concluded.)

GROUP V

This group is typified by *Pachyrrhynchus venustus* Waterh. Large species, prothorax in the middle with two dorsolateral spots, no dorsal spot at base, and a large oblong spot at lateral margins. Elytra with roundish, oval, or oblong spots. To the above there is one exception: *P. venustus insulanus* Schultze has no spots at all.

Key to the species of *Pachyrrhynchus*, Group V.

a¹. Prothorax and elytra with spots.

b¹. All spots sulphur yellow..... *P. sulphureomaculatus* Schultze.

b². No yellow spots.

c¹. Prothorax with the dorsolateral spots small.

d¹. Prothorax with the dorsolateral spots roundish, reddish, or coppery golden..... *P. venustus* Waterh.

d². Prothorax with the dorsolateral spots oval, very pale to whitish green *P. smaragdinus* Behrens.

c². Prothorax with the dorsolateral spots medium to large.

e¹. Prothorax with the dorsolateral spots medium oblong-oval, all spots pale lilac or whitish..... *P. confusus* Schultze.

e². Prothorax with the dorsolateral spots large to very large, not lilac.

f¹. Prothorax with the dorsolateral spots large, oval, all spots pale reddish..... *P. rufopunctatus* Waterh.

f². Prothorax with the dorsolateral spots oblong, green.

g¹. Prothorax with the dorsolateral spots very large, oblong, reaching from posterior almost to anterior margin, all spots pale green; elytra with a violet sheen.

P. helleri Kuntzen.

g². Prothorax with the dorsolateral spots large, oblong, all spots bright green; no violet sheen on elytra.

P. apicatus Schultze.

a². No spots on prothorax or elytra..... *P. venustus insulanus* Schultze.

¹ For first half of Part I with Plates 1 to 6 see Philip. Journ. Sci. 23 (1923) 609-673.

Pachyrrhynchus venustus Waterh. Plate 2, fig. 20 (lateral view);
Plate 7, fig. 10, ♀.

Pachyrrhynchus venustus WATERH.,² Proc. Ent. Soc. London (1841) 18; Trans. Ent. Soc. London I 3 (1841-1843) 310; Ann. & Mag. Nat. Hist. I 8 (1841) 218; SCHOENH., Gen. Curc. Suppl. 8 (1845) 381; SCHULTZE, Philip. Journ. Sci. 23 (1923) 80.

Pachyrrhynchus venustus var. β WATERH., Proc. Ent. Soc. London (1841) 18.

Pachyrrhynchus venustus var. γ Waterh., Proc. Ent. Soc. London (1841) 18.

Pachyrrhynchus venustus var. *auromaculatus* KRAATZ, Deutsche Ent. Zeitschr. (1888) 27.

Pachyrrhynchus virgatus SCHULTZE, Philip. Journ. Sci. 15 (1919) 549, pl. 1, fig. 1, ♀.

Very glossy black, with reddish or coppery golden scale spots, which are strongly opalescent in fresh specimens. Rostrum in apical half finely and scatteredly punctate, basal half with a shallow depression and a longitudinal medial groove. Front with a roundish scale spot, sides of head below eye with a small squarish spot. Prothorax laterally in the middle between anterior and posterior margins with a roundish scale spot and another, larger, oblong spot at each lateral margin. Elytra impunctate, usually with twenty to twenty-two roundish or short-oval spots. Each elytron with two larger oval spots at base. Three or four spots before the middle form a cross row, the marginal spot of which is elongated and extends backward. At apical third of elytron one or two other roundish spots and another at apical triangle. Also, a bifid sutural spot at the middle and another at apical fourth. Penis structure, Plate 3, fig. 16.

Male, length, 17.5 millimeters (without rostrum); width, 6.5. Female, length, 18 millimeters (without rostrum); width, 7.8.

MINDANAO, Surigao Province, Surigao. DINAGAT (*Schultze*). LEYTE, near Palompon (*V. Elicaño*).

In *Pachyrrhynchus venustus* the number of spots on elytra is variable. Waterhouse founded his var. β on specimens with eighteen spots and var. γ on specimens with sixteen spots. Most commonly this species has twenty-two spots.

²Sp. 1. *Pachyrrhynchus venustus*, W. Niger laevis; capite macula unica interoculos, thorace maculis duabus supra, maculagulae una ad utrumque marginem, elytris viginti-duabus ovatis ornatis; his a squamis auratis, vel aureo-cupreis, effectis.

Var. β differt elytris maculis octodecim ornatis.

Var. γ differt elytris maculis sexdecim ornatis. Long. corp. lin. 10 $\frac{1}{2}$ -7 $\frac{1}{2}$.

This species is rather easy to distinguish from related species by the peculiar opalescence of the spots in fresh specimens, and still more so by the very characteristic penis structure.

Pachyrrhynchus venustus subsp. *insulanus* Schultze.

Pachyrrhynchus virgatus subsp. *insulanus* SCHULTZE, Philip. Journ. Sci. 15 (1919) 549.

Uniformly glossy black, without any scale spots or markings. In general form, stouter in build than typical *venustus*, and the elytra appear more inflated and broadly rounded at apex.

SIARGAO and BUCAS GRANDE.

Among the numerous perfect specimens of this unicolorous form from the above localities, none was found which had even traces of spots. In contrast to this fact, among many specimens of *P. venustus* from Surigao, Mindanao, with the usual number of spots, none was found without the spots. A parallel in respect to locality and the same color differences is found in the mimicry form of the above, namely *Metapocyrtus* (*Orthocyrtus*) *schönherri* Waterh. (= *malayanus* Schultze).³ This species very much resembles *P. venustus* in general appearance and arrangement of spots. A uniformly black local form, *Metapocyrtus schönherri* Waterh. subsp. *atratus* Schultze, is found on Bucas Grande Island and was collected from the same plants as *Pachyrrhynchus venustus insulanus*.⁴

Concerning the species *Pachyrrhynchus venustus* Waterh., I may mention that two other species, *P. rufopunctatus* Waterh. and *P. confusus* Schultze, were wrongly identified and redescribed as the above species by Behrens.⁵ Also, Heller's⁶ diagnosis is not referable to the above species, but to *P. confusus*. The biological notes⁷ on *P. venustus* Waterh. by myself are also based on incorrect determination, the species in question being *P. confusus*.

Pachyrrhynchus confusus Schultze. Plate 2, fig. 18 (lateral view); Plate 7, fig. 5, ♀.

Pachyrrhynchus confusus SCHULTZE, Philip. Journ. Sci. 23 (1923) 81.

Pachyrrhynchus venustus BEHRENS, part., Stett. Ent. Zeitg. 48 (1887) 251; HELLER, Philip. Journ. Sci. § D 7 (1912) 307;

³ Philip. Journ. Sci. 15 (1919) 553.

⁴ Philip. Journ. Sci. 23 (1923) 80.

⁵ Stett. Ent. Zeitg. 48 (1887) 251-253.

⁶ Philip. Journ. Sci. § D 7 (1912) 307.

⁷ Philip. Journ. Sci. § D 13 (1918) 276, pl. 1, figs. 10, 11.

SCHULTZE, Philip. Journ. Sci. § D 13 (1918) 276, pl. 1, figs. 10 and 11, 21 (1922) 593, pl. 3, fig. 2.

Black glossy, the elytra very finely rugose, with indistinct interrupted longitudinal rows of punctures. Scale spots very pale lilac, in old specimens sometimes whitish. Rostrum evenly but scatteredly punctate, basal half with an oblong depression and a longitudinal medial groove. Front with a squarish scale spot and another, smaller one below eyes. Prothorax as long as broad, the greatest width at the middle, finely and scatteredly punctate. Laterally, in the middle, between anterior and posterior margins, an oblong-oval spot. At each lateral margin another, larger scale spot. Each elytron with two large oblong-oval basal spots, one discally, the other laterally, sometimes a small roundish spot between the two. Three other spots before the middle, of which the one located at lateral margin is very oblong, reaching backward beyond the middle. On apical third another cross row of two or three spots and a triangular spot at apex. Also, each elytron bears a sutural spot at the middle and another on apical fourth. Apical sutural termination of elytra obtusely pointed in female. Penis structure, Plate 3, fig. 35.

Male, length, 16 millimeters; width, 6.5. Female, length, 17.3 millimeters; width, 7.5.

LUZON, Laguna Province, Los Baños (Schultze); in swamp, feeding on the fern *Acrostichum aureum* Linn.

This species was confounded for many years with *P. venustus* Waterh. and *P. rufopunctatus* Waterh.

Pachyrrhynchus rufopunctatus Waterh. Plate 2, fig. 19 (lateral view); Plate 7, fig. 16, ♂.

Pachyrrhynchus rufopunctatus WATERH., Proc. Ent. Soc. London (1842) 45; Trans. Ent. Soc. London I 3 (1843) 311⁸; SCHOENH., Gen. Curc. Suppl. 8 (1845) 382; SCHULTZE, Philip. Journ. Sci. 23 (1923) 80.

Pachyrrhynchus venustus BEHRENS, part., Stett. Ent. Zeitg. 48 (1887) 251; HELLER, Philip. Journ. Sci. § D 7 (1912) 307.

Black, moderately shiny, with pale reddish scale spots. Rostrum sparsely and scatteredly punctate in apical half. Basal half with a shallow depression and a fine medial groove. Front with a large scale spot. Another triangular scale spot below

⁸ *Pachyrrhynchus rufo-punctatus*, Wat. *P. niger*, *brevis*, *capite* maculis tribus, *thorace* maculis duabus *discoidalibus* *maculaque* una *ad* *utrumque* *marginem*; *elytris* *guttis* 22 *rufo-squamosis* *ornatis*. Long. corp. lin. 8½. Nearly allied to *P. venustus*.

eyes. Prothorax finely and evenly punctate. Laterally with an oblong-oval spot and at each lateral margin a larger scale spot. The position of the spots on elytra is very similar to that in *P. venustus* Waterh.; they are also variable in number, between twenty and twenty-two.

Male, length, 14.5 millimeters (without rostrum); width, 6.5. Female, length, 17 millimeters (without rostrum); width, 7.

POLILLO (*my collector*).

Specimens of this species I received only from Polillo Island. They agree perfectly with a typical specimen, collected by Cumming, loaned by the British Museum.

This species is slenderer in general form than *P. venustus*; it is most closely related to *P. apicatus* Schultze.

Pachyrrhynchus sulphureomaculatus Schultze. Plate 3, fig. 5 (lateral view); Plate 7, fig. 1, ♀.

Pachyrrhynchus sulphureomaculatus SCHULTZE, Philip. Journ. Sci. 21 (1922) 576, pl. 2 fig. 1, ♀.

Glossy black, with sulphur yellow scale spots. Rostrum in apical half sparsely and scatteredly punctured, basal half with an oblong shallow depression, with a strongly pronounced longitudinal median groove. Front with a round scale spot. Prothorax as long as broad, in the middle toward each side with an oval scale spot and another large oblong spot at each lateral margin. Elytra short-ovate, the surface smooth and impunctate. Each elytron with eleven roundish or oval and two sutural spots, located as follows: Three spots form a cross row at base, three others form another cross row before the middle, of which the one located next to lateral margin is very large and oblong; another very large elongated spot at lateral margin in the middle and four spots in apical third; one small sutural spot is located at the middle, the other at apical fourth. Legs black, femora with an oblong scale spot on underside apically.

Female, length, 15.5 millimeters (without rostrum); width, 7.

MINDANAO, Cotabato Province, Cotabato (*C. M. Weber*).

Pachyrrhynchus smaragdinus Behrens. Plate 9, fig. 6, ♀.

Pachyrrhynchus smaragdinus BEHRENS, Stett. Ent. Zeitg. 48 (1887) 253; KRAATZ, Deutsche Ent. Zeitschr. (1888) 32; HELLER, Philip. Journ. Sci. § D 7 (1912) 307.

Pachyrrhynchus smaragdinus var. *carnosus* KRAATZ, Deutsche Ent. Zeitschr. (1888) 32.

Pachyrrhynchus smaragdinus var. *purpurascens* KRAATZ, Deutsche Ent. Zeitschr. (1888) 32.

Glossy black, prothorax and elytra with pale greenish scale spots. Rostrum dorsally in basal half with a rather shallow depression and an indistinct medial groove; between eyes an indistinct transverse groove. Front with a triangular roundish scale spot, sides of head with another spot below eyes. Prothorax as long as broad, the greatest width in the middle. Dorsally toward each side, in the middle between anterior and posterior margins, a scale spot and another oblong, larger spot at lateral margins. Elytra oblong-ovate, very similar in form to the elytra of *P. confusus* Schultze. Each elytron with eight to ten roundish or short elliptical spots and two sutural spots, one of which is slightly behind the middle, the other at apical fourth. Two large spots at base; three smaller spots form a transverse row before the middle, the dorsolateral one of which is dotlike and very small; one large oblong marginal spot at the middle; three other spots form a cross row behind the middle, the dorso-lateral one of which is also very small; and a triangular spot at apex. Mesosternum, metasternum, and first and second abdominal sternites with a spot laterally. Femora with a small spot near apex.

Female, length, 16.5 millimeters (without rostrum); width, 7.5.

Philippines, without exact locality (*Semper*).

The only specimen of this species in my collection, which I obtained in exchange from the Dresden Museum, is labeled "Talaun Insel"? (ex coll. Faust).

The measurements of this species, according to Behrens, are as follows: "Long. 18.5–22 mm. lat. 9.5–10 mm."

This species also seems to be variable with reference to the number of spots on the elytra. The var. *carnosus* and var. *purpurascens* Kraatz seem to refer to color variations of the spots.

Pachyrrhynchus apicatus Schultze. Plate 2, fig. 17 (lateral view); Plate 7, fig. 9, ♀.

Pachyrrhynchus apicatus SCHULTZE, Philip. Journ. Sci. 21 (1922) 575, pl. 3, fig. 1 (penis structure).

Glossy black; head, prothorax, and elytra with large greenish yellow scale spots. Rostrum in apical half fine and scatteredly punctured, basal half with a shallow triangular depression and a medial groove. Front with another very shallow depression beset with a large scale spot. Sides of head with a large scale

spot below eye. Prothorax longer than broad, finely regularly scatteredly punctured. A large elongate scale spot in the middle toward each side and another at lateral margin. Elytra oblong-ovate, finely coriaceous, apical termination in female beak-shaped, in male obtusely rounded. Each elytron with ten scale spots; two large oval spots at base, three others forming a cross row before the middle, of which the marginal one is very large and extends posteriorly, two other dorsolateral spots in apical third, and a triangular spot at apex; there are also two sutural spots, one in the middle and the other near apex. Underside of prosternum, mesosternum, and metasternum beset with scales. First and second abdominal sternites with a large spot laterally. Femora with a large scale spot on underside near apex, and an irregular dash of scales above. Penis structure, Plate 3, fig. 34.

Male, length, 17.6 millimeters (without rostrum); width, 7. Female, length, 19 millimeters (without rostrum); width, 8.

POLILLO (*Schultze*).

Pachyrrhynchus helleri Kuntzen. Plate 8, fig. 16, ♀.

Pachyrrhynchus helleri KUNTZEN, Deutsche Ent. Zeitschr. (1914) 452, pl. 13, figs. 1 and 2.

Glossy black, with a well-pronounced violet sheen, prothorax and elytra with pale green scale spots. Form of elytra very similar to that of *Pachyrrhynchus venustus* Waterh. Rostrum in basal half with a prominent depression beset with a scale spot. Another spot at sides of rostrum and head. Prothorax slightly longer than broad, dorsolaterally with a broad stripe reaching from posterior to near anterior margin. Another broad stripe at lateral margins. Elytra uniformly oblong-oval. Each elytron with nine large oval scale spots, two of which are sutural spots, one at about the middle, the other next to apex. Two of the other spots form a cross row at base; three form another cross row in the middle, the latter of which, the marginal spot, is very large and directed backward; and two spots in apical third. Underside; mesosternum, metasternum, and first and second abdominal sternites with a large spot laterally. Femora with a small spot near apex.

Female, length, 16 millimeters (without rostrum); width, 7.3.

LUZON (*Jagor*); exact locality unknown.

This species is very meagerly described by Kuntzen. The only specimen known to me is the type, which I examined in the Zoölogical Museum at Berlin.

GROUP VI

The species of this group are typified by *Pachyrrhynchus multipunctatus* Waterh.; in general form they are similar to the *P. moniliferus* group. Prothorax and elytra with scale spots; prothorax in all species with two discal spots.

Key to the species of Pachyrrhynchus, Group VI.

*a*¹. General color black.

*b*¹. Elytra with a large number of small scale spots.

P. multipunctatus Waterh.

*b*². Elytra with large scale spots placed in irregular transverse rows.

P. pseudoproteus Schultze.

*a*². General color coppery, elytra at base with four large spots and one transverse spot in the middle; total number of spots, twelve.

P. elegans Waterh.

Pachyrrhynchus multipunctatus Waterh. Plate 1, fig. 29 (lateral view); Plate 5, fig. 9.

Pachyrrhynchus multipunctatus WATERH., Proc. Ent. Soc. London (1841) 20; Ann. & Mag. Nat. Hist. 8 (1841) 219; Trans. Ent. Soc. London I 3 (1843) 322; ⁹ SCHOENH., Gen. Curc. Suppl. 8 (1845) 385; HELLER, Philip. Journ. Sci. § D 7 (1912) 311.

Pachyrrhynchus auroguttatus CHEVR., Le Naturaliste (1881) 348; HELLER, Philip. Journ. Sci. § D 7 (1912) 303.

Black, moderately glossy, prothorax and elytra with small pale yellowish green scale spots, smaller than eye. Rostrum in apical half coarsely and remotely punctured, in basal half depressed with a shallow roundish impression in the middle, at base near eyes a few wrinkles. Front with a small oblong scale spot. Prothorax as long as broad, with an indistinct anterior submarginal groove, discally with two scale spots and a small spot dorsolaterally at anterior margin. Lateral margins with an irregular stripe. Elytra minutely striate-punctate. Each elytron with three scale spots or dots at base, in the second fourth about eight spots forming an irregular cross row, two

⁹ The short Waterhouse description is as follows:

Sp. 18. *Pachyrrhynchus multipunctatus*, Waterh.

Ater; capite maculis tribus, earum una interoculari, una utrinque suboculari; thorace nitido, dorso binotato, ad latera lineis duabus; elytris punctis plurimis ornatis; his lineis punctisque viridibus.

This species is equal in size to the *P. moniliferus*, but its form is more elongated. Scarcely a trace of any punctures is observable on the head and thorax. On the elytra are rows of very minute punctures.

small sutural spots in the middle and about twelve small dots scattered in apical third. Mesosternum with a large scale spot, metasternum and first abdominal sternite as well as femora near apex, with a small spot laterally.

Male, length, 11.8 millimeters (without rostrum); width, 5.5. BOHOL, Sevilla (*Schultze*).

Pachyrrhynchus pseudoproteus Schultze, Plate 2, fig. 8, ♂ (lateral view); Plate 9, fig. 13.

Pachyrrhynchus pseudoproteus SCHULTZE, Philip. Journ. Sci. 21 (1922) 580, pl. 2, fig. 2, ♂.

Black; head, prothorax, and legs glossy, elytra dull, finely coriaceous, with pale green scale spots. Rostrum in apical half scatteredly punctured, basal half with a strongly developed depression, the dorsolateral edges swollen. Front with an oblong-oval scale spot and another on sides of head. Prothorax as long as broad, glossy and impunctate. Discally with two wedge-shaped spots placed transversely close to each other. On the lateral margins two undulated stripes which are confluent at posterior but divergent toward anterior margin. Elytra short-ovate, punctate-striate, the interstices slightly swollen. Each elytron with three spots at base, in the middle two cross rows of about six larger spots, variable in size, between which some smaller dots are located, and an elongated marginal spot. In apical third three more or less laterally confluent spots and a short dorsal longitudinal stripe confluent at apex with an abbreviated marginal stripe. Mesosternum, metasternum, and first abdominal sternite with a spot laterally. Femora with a large spot near apex.

Male, length, 10.8 millimeters (without rostrum); width, 5. LUZON, Laguna Province (*A. Worm*).

Pachyrrhynchus elegans Waterh.

Pachyrrhynchus elegans WATERH., Proc. Ent. Soc. London (1842) 45; Trans. Ent. Soc. London I 3 (1843) 313; SCHOENH., Gen. Curc. Suppl. 8 (1845) 382; HELLER, Philip. Journ. Sci. § D 7 (1912) 311.

Glossy coppery, prothorax and elytra with pale green scale markings. Prothorax with two oblique discal spots. This species seems to be related to *P. multipunctatus* Waterh. and *P. pseudoproteus* Schultze; since it is known to me only from the

literature, I prefer to give the original description of Waterhouse:

Splendide cupreus; capite maculis tribus, thorace maculis duabus supra, maculâque unâ ad utrumque marginem; elytris maculis duodecim ornatis; his maculis magnis et subocellatis, e squamis pallide viridibus effectis.

Long. corp. $7\frac{1}{2}$ lin., lat. $3\frac{1}{2}$ lin.

This species is considerably larger and more elongated in form than *P. moniliferus*. It is of a brilliant copper colour, and smooth: the forehead and base of the rostrum are concave, and the latter has a deep transverse impression; on the head above is a round spot, and under each eye is an oblong spot. The thorax has two oblique patches above, and a broadish mark on each side. Elytra impunctate, with four largish spots at the base; in the middle of each elytron is a transverse patch, which joins a second longitudinal patch placed on the outer margin; behind the middle are two sutural spots; and on each elytron is a spot very near the apex, and another close above this: all these spots are formed of scales of a very delicate green colour, those on the elytra however have each a scaleless space in the middle. The sides of the meso- and metasternum, and of the two first segments of the abdomen, are adorned with green scales.

Philippines; exact locality unknown.

GROUP VII

This group is typified by *Pachyrrhynchus anellifer* Heller. Small species, elytra very short-ovate, general color black. Eyes rather prominently bulging. Legs relatively long and slender, particularly the tibiae.

Key to the species of *Pachyrrhynchus*, Group VII.

- a^1 . Elytra with well-pronounced longitudinal grooves beset with fine scales, or the grooves circumscribing oblong-oval areas.
 - b^1 . Elytra with longitudinal grooves..... *P. erosus* Schultze.
 - b^2 . Elytra with grooves forming oblong-oval scale rings.
 - P. annulatus* Chevrolat.
- a^2 . Elytra with slightly impressed, more roundish scale rings, scale dots or regular spots.
 - c^1 . Prothorax finely coriaceous.
 - d^1 . Elytra with slightly impressed roundish scale rings.
 - P. anellifer* Heller.
 - d^2 . Elytra with small, slightly impressed scale spots or dots forming irregular cross rows..... *P. schuetzei* Schultze.
 - c^2 . Prothorax smooth, elytra with twenty-eight well-defined scale spots, two of which are bifid sutural spots..... *P. baluganus* sp. nov.

Pachyrrhynchus anellifer Heller. Plate 1, fig. 9, ♀ (lateral view); Plate 6, fig. 17.

Pachyrrhynchus annulatus BEHRENS, Stett. Ent. Zeitg. (1887) 256.

Pachyrrhynchus anellifer HELLER, Philip. Journ. Sci. § D 7 (1912) 324.

Black, glossy, prothorax and elytra with cream or flesh-colored scale ringlets. Rostrum very similar to that of *Pachyrrhynchus annulatus* Chevr. The shallow dorsal depression in basal half with a small bifid scale spot and a well-defined medial groove. Prothorax slightly broader than long, subglobular, remotely punctured, and with a faintly pronounced medial groove. Dorsolaterally in the middle with a more or less distinct ring figure, lateral margins with a scale spot. Elytra short-ovate, faintly and remotely striate-punctate. Each elytron mostly with fourteen roundish scale ringlets, a little larger than eye, two of them at suture near the middle and apex. The other ringlets form three irregular transverse rows; one row at base with four ringlets, the third of which is placed slightly backward; the second row in the middle, also with four ringlets, the marginal one of which is oblong; the third row contains three ringlets; another somewhat triangular ringlet is located near apex.

Mesosternum, metasternum, and first, second, and last abdominal sternites with a scale spot laterally. Femora with a scale spot near apex. Penis structure, Plate 3, fig. 27.

Male, length, 11.5 millimeters (without rostrum); width, 5. Female, length, 12.8 millimeters (without rostrum); width, 6.5.

LUZON, Benguet Subprovince, Irisan River (*McGregor*); Mount Santo Tomas (*Mrs. M. Schultze and W. Schultze*).

Pachyrrhynchus annulatus Chevr. Plate 1, fig. 8, ♀ (lateral view); Plate 6, fig. 19.

Pachyrrhynchus annulatus CHEVR., Le Naturaliste (1881) 348;
HELLER, Philip. Journ. Sci. § D 7 (1912) 311; SCHULTZE, Philip.
Journ. Sci. § D 12 (1917) 253.

Black, moderately glossy. Elytra with strongly impressed oblong-oval grooves, beset with pale flesh-colored scales. Apical half dorsally strongly swollen, basal half depressed with a shallow impression, beset with a large oblong scale spot, divided by a medial groove reaching to front. Prothorax slightly broader than long, finely and remotely punctured, a well-developed anterior submarginal groove and a narrow scale line along anterior and posterior margins. In the middle an indistinct longitudinal groove. Dorsolaterally a small indistinct irregular ring figure and another ring marking at lateral margins. Elytra short-ovate, finely coriaceous. Each elytron mostly with seventeen oblong-oval ring grooves of which four

smaller ones are located subsuturally. The others, which are larger, form three irregular cross rows; a more-triangular ring groove is located near apex. The central part circumscribed by the grooves is distinctly swollen and smooth. Underside, mesosternum, metasternum, and first and second abdominal sternites with a patch of scattered scales laterally. Femora with some scattered scales on underside near apex.

Male, length, 13 millimeters (without rostrum); width, 6. Female, length, 13 millimeters (without rostrum); width, 6.2.

LUZON, Benguet Subprovince, Mount Pulog (McGregor; *F. Relay*).

This species is closely related to *Pachyrrhynchus anellifer* Heller, and in its distribution seems to be restricted to the above-mentioned mountain.

Pachyrrhynchus schuetzei Schultze. Plate 1, fig. 10 (lateral view); Plate 6, fig. 18, ♀.

Pachyrrhynchus schuetzei SCHULTZE, Philip. Journ. Sci. § D 12 (1917) 253, pl. 1, fig. 7, ♀.

Black, with a coppery gloss and numerous yellowish white scale ringlets or dots. Rostrum set off transversely in the middle. On basal part a small, double scale spot divided by a longitudinal groove. The latter terminates between eyes and is somewhat shorter, as in *P. anellifer* Heller. Prothorax a little broader than long. Anterior and posterior margins with a fine scale line. A shallow, longitudinal medial groove along which a few scales are located. In the middle, but laterad, a shallow dimple-like depression surrounded by a ring of scales. At lateral margin a group of a few scales. Elytra with irregular rings of scales in transverse rows. The first row parallel to basal margin, each elytron having three large oval rings and four smaller spots. The spaces within the large rings are frequently filled with scales. In the first row the spots are located as follows: A small dotlike spot next to suture, two larger ones in the middle, a few small ones, again one larger, and a small one at lateral margin. The second row runs about parallel to first row, each elytron with four larger and next to lateral margin a few small spots. A third, interrupted row, composed of two rings on each elytron, is located at the beginning of apical third thereof.

Between second and third rows, as well as in apical area of elytron, a subsutural double spot, this being rather long and narrow. In apical triangle a large, irregular, triangular spot. Scattered among the different larger rings of elytra are a number of scaly dots. In the male the elytra are not so glossy as in the female; in the former they have very slight indications of longitudinal furrows, and the spots are more dotlike.

Male, length, 11 millimeters (without rostrum); width, 5. Female, length, 14 millimeters (without rostrum); width, 6.

LUZON, Benguet Subprovince, Pauai (Haight's place) (*O. Schütze*; *Schultze*).

This species has a superficial resemblance to *P. anellifer* Heller, but I have examined numerous specimens of both species and there are no intermediate forms among them. The differences between the two species seem to be very constant. It appears as if *P. annulatus* Chevr., *P. anellifer* Heller, and *P. schuetzei* are closely related species, which apparently represent transitional stages of their evolution.

Pachyrrhynchus erosus Schultze. Plate 1, fig. 7, ♂ (lateral view); Plate 6, fig. 20, ♀.

Pachyrrhynchus erosus SCHULTZE, Philip. Journ. Sci. 16 (1920) 199.

Black, glossy, elytra with a series of fine shallow longitudinal grooves which form loops beset with creamy white scales. Rostrum in basal half strongly depressed with a bifid scale spot and a sharply defined medial groove extending to front. Prothorax subglobular with a strongly pronounced anterior and posterior submarginal groove. Each elytron with nine or ten longitudinal grooves, respectively, one at suture being common to both elytra, beset with creamy white scales, the grooves forming five loops. The subsutural loop is mostly interrupted, forming several elongate-oval figures; the second, third, and fifth extend from near base to apical fourth. The fourth loop is abbreviated anteriorly. At the apical triangle a triangular loop, which in some specimens is connected with the fifth or marginal loop. Femora with a scale spot apically.

Male, length, 12 millimeters (without rostrum); width, 5. Female, length, 14 millimeters (without rostrum); width, 6.6.

LUZON, Benguet Subprovince, Mountain Trail near Atok (*Schultze*).

*Pachyrrhynchus baluganus*¹⁰ sp. nov. Plate 2, fig. 2 (lateral view).

Glossy black with brownish sheen. Prothorax and elytra with pale green scale spots. Rostrum dorsally in apical half strongly swollen, basal half flattish depressed with a well-pronounced medial groove and two small scale spots. A small patch of scales on sides of rostrum and a larger spot below eyes. Prothorax broader than long, with an oval scale spot in the middle toward each side. Along anterior margin a fine, more or less interrupted scale line confluent at lateral margins with an oblong scale spot. Another scale line along posterior margin. Elytra short-ovate, with almost obsolete traces of puncture rows. Each elytron with four spots in basal fourth, three spots forming a cross row in the middle, one large marginal spot extending backward from about the middle, three other rather large oval spots forming a cross row in apical third, a small spot and a large triangular spot near apex. Besides those mentioned, two oblong bifid sutural spots behind the middle and at apex. Underside, prosternum, and mesosternum beset with scales; metasternum and first abdominal sternite with a spot laterally. Femora with a scale spot on underside near apex.

Female, length, 13.2 millimeters (without rostrum); width, 6.4.

LUZON, Rizal Province, Mount San Isidro (*Schultze*).

GROUP VIII

This group is typified by *Pachyrrhynchus congestus* Pascoe. Mostly medium-sized to large species. Prothorax dorsally with a more or less triangular rounded spot at base and two dorso-lateral spots, one toward each side, before the middle or at anterior margin. Elytra mostly with roundish or oval, well-defined spots; exceptionally the spots longitudinally confluent, forming stripes.

Key to the species of Pachyrrhynchus, Group VIII.

- a*¹. Elytra with oblong spots, longitudinally more or less confluent, forming stripes; prothorax with dorsolateral spots at anterior margin and a triangular spot dorsally at base.
- b*¹. Spots on elytra elongate, reddish ochraceous, at lateral margins mostly confluent, forming a marginal stripe..... *P. lorquini* Chevr.

¹⁰ Balugas is a Tagalog name for some denizens of Luzon living in the mountain regions of Rizal Province, who are of mixed Negrito and Tagalog blood.

- b*³. Each elytron with four broad longitudinal, brilliant greenish and reddish stripes..... *P. dohrni* Behr.
- a*². Elytra with more or less roundish spots, not confluent longitudinally so as to form stripes.
- c*¹. Prothorax and elytra apparently uniform black but really with inconspicuous achromatic dull grayish spots; elytra dull black.
P. morio Heller.
- c*². Prothorax and elytra with conspicuously colored spots.
- d*¹. General body color black.
- e*¹. Prothorax with dorsolateral spots at anterior margin.
- f*¹. Elytra with large more or less contiguous spots.
- g*¹. Spots dull pale bluish gray with pale reddish margins.
P. congestus Pascoe.
- g*². Spots dull uniform pale grayish blue.
P. congestus var. *immarginatus* Kraatz.
- g*³. Spots with brilliant metallic blue center and broad greenish golden margin..... *P. congestus pavonius* Heller.
- f*². Elytra with spots more or less widely spaced.
- h*¹. Spots small, uniform light blue.
P. congestus caeruleus Kraatz.
- h*². Spots with conspicuous porcelain white margin, the dark blue center inconspicuous, so that the spots apparently form rings..... *P. congestus ocellatus* subsp. nov.
- h*³. Spots relatively smaller, roundish, uniform pale green.
P. viridans Heller.
- e*². Prothorax with the dorsolateral spots not reaching anterior margin.
- i*¹. Spots large and close together; male with sparkling iridescent blue-green spots; female with uniform blue spots not iridescent or sparkling..... *P. sanchezi* Heller.
- i*². Spots widely spaced, medium to small.
- j*¹. Spots dark blue, rather small..... *P. benguetanus* sp. nov.
- j*². Spots pale green, reddish green, or flesh color.
P. sarcitis Behrens.
- d*². General color not black, but dark purplish.
- k*¹. Dorsolateral spots at anterior margin. Spots on elytra small, roundish, pale greenish yellow..... *P. chlorites* Chevr.
- k*². Dorsolateral spots not at anterior margin.
- l*¹. General color dark reddish purplish wine colored. Size medium.
- m*¹. Spots on elytra large, rather close together laterally, scales in central part of spots greenish, toward margin reddish.
P. gemmatus Waterh.
- m*². Spots smaller, more widely spaced.
P. gemmatus purpureus Kraatz.
- l*². General color blackish purplish with violet sheen. Size large.
- n*¹. Spots very brilliant, scales in central part blue and green, toward margin reddish golden..... *P. taylori* Schultze.
- n*². Spots very large, touching each other, more uniform brilliant greenish metallic..... *P. taylori metallescens* Schultze.

Pachyrrhynchus congestus Pasc. Plate 1, fig. 20, ♀ (lateral view);
Plate 6, fig. 14, ♀.

Pachyrrhynchus congestus PASC., Journ. Linn. Soc. London 11 (1873) 155; BEHR., Stett. Ent. Zeitg. 48 (1887) 249; KRAATZ, Deutsche Ent. Zeitschr. (1888) 28; HEYDEN, 42. Ber. Senkenb. Naturf. Ges. (1911) 84, pl. 1, fig. 1; HELLER, Philip. Journ. Sci. § D 7 (1912) 307.

Pachyrrhynchus luteoguttatus CHEVR., Le Naturaliste 3 (1881) 360.

Pachyrrhynchus immarginatus KRAATZ, Deutsche Ent. Zeitschr. (1888) 28.

Glossy black; prothorax and elytra with large eyespots which are slightly impressed. In the central area of these spots the scales are light blue, the marginal rim cream colored, yellowish, or pale reddish. Rostrum in apical half finely punctate, basal half with a deep, roundish depression. Sides of head below eye with a small patch of whitish hairs. Prothorax longer than broad, the greatest width before the middle, very finely and scatteredly punctate. Two scale spots at anterior margin, laterad of the middle; a large scale spot at posterior margin in the middle, and a very large spot at each lateral margin. Elytra elongate-ovate, each elytron with ten or eleven spots and two spots located on suture in apical half. Of the eleven spots two are located at base, four form an irregular cross row before the middle, four are behind the middle, and a more or less triangular spot at apical triangle. Two marginal spots at the middle are sometimes confluent. Fore coxæ also with a scale spot. Mesosternum, metasternum, and first and second abdominal sternites with a spot laterally. Femora with a small spot apically on underside. Penis structure, Plate 3, fig. 18.

Male, length, 11.5 millimeters (without rostrum); width, 4.6 to 6. Female, length, 15 to 17 millimeters (without rostrum); width, 6.3 to 7.3.

LUZON, Benguet Subprovince, Baguio; Mount Mirador; Mount Santo Tomas; Trinidad; Mountain Trail from Baguio to rest house at kilometer 88 (*Schultze*).

This species is also very variable and is found in many local forms, which differ almost solely in regard to the size and the color of the spots on prothorax and elytra. The effect produced by these color and size differences of the spots gives some of the forms the misleading aspect of specific difference. Examination of the penis structure of several of these local forms has revealed no appreciable differences. Concerning these local color

variations I wish to take strong exception to the following statement, made by Kraatz,¹¹ in respect to some of these local forms of *P. congestus* Pasc.:

Nach der herrschenden Ansicht müssen diese Formen von verschiedenen Fundorten als Arten betrachtet werden; wir sind in diesem Falle im Stande, klar die Verschiedenheit einerseits und die Uebereinstimmungen anderseits auseinander zu setzen und vermögen so zu sagen der Natur in die Geheimnisse ihrer Werkstatt zu folgen.

I consider the specimens from the neighborhood of Baguio to be typical of *P. congestus*. In some specimens the eyespots, due to large size, touch each other only laterally; but in other specimens, particularly from around the regions of Atoc, Benguet, the eyespots are almost all confluent, covering the elytra almost entirely. The component scales of these spots are very small and of a more or less uniform ashy grayish color.

Pachyrrhynchus congestus var. *immarginatus* Kraatz.

Pachyrrhynchus immarginatus KRAATZ, Deutsche Ent. Zeitschr. (1888) 28; HELLER, Philip. Journ. Sci. § D 7 (1912) 308.

Prothorax and elytra with the spots relatively large, uniformly sky blue or pale grayish blue.

LUZON, Benguet Subprovince, near rest house, kilometer 88, and vicinity of Mount Data (*my collector*).

Other specimens which differ more considerably from the more or less typical forms are the following:

Pachyrrhynchus congestus subsp. *caerulans* Kraatz. Plate 5, fig. 8, ♀.

Pachyrrhynchus coerulans KRAATZ, Deutsche Ent. Zeitschr. (1888) 29; HELLER, Philip. Journ. Sci. § D 7 (1912) 308.

Glossy black, prothorax and elytra with blue scale spots. Rostrum in form and sculpture very similar to *P. congestus* Pasc. Prothorax longer than broad, the greatest width before the middle, minutely and scatteredly punctate. The spots on prothorax and elytra are usually smaller than in typical *P. congestus*, but their position is exactly the same as in the latter species. The color of the spots is mostly light blue in absolutely fresh specimens; a very narrow marginal ring of each spot is composed of fine bronze green scales.

¹¹ Deutsche Ent. Zeitschr. (1888) 29.

Male, length, 13.6 to 15 millimeters (without rostrum); width, 5 to 5.7. Female, length, 14 to 15 millimeters (without rostrum); width, 6 to 6.7.

LUZON, Bontoc and Kalinga Subprovinces, Mount Polis Range (Taylor; Herre; my collector).

Some specimens from the vicinity of Lubuagan have the general color dull glossy with a bronze sheen; the color and position of the spots is exactly the same as stated above.

Pachyrrhynchus congestus subsp. *caerulans* var. *robustus* Heller.

Pachyrrhynchus caerulans var. *robustus* HELLER, Deutsche Ent. Zeitschr. (1916) 281.

Very large, prothorax without the dorsal spot in the middle at base, but with a small scale dot dorsolaterally. The spots on elytra as in *caerulans*, only the last two marginal spots confluent.

Length, 19 millimeters; width, 8.

LUZON, Benguet Subprovince, Baguio (Baker).

The locality Baguio for this variation seems doubtful to me.

Pachyrrhynchus congestus subsp. *pavonius* Heller. Plate 8, fig. 4, ♀.

Pachyrrhynchus pavonius HELLER, Philip. Journ. Sci. 19 (1921) 543.

Glossy black with purplish or violet sheen. Prothorax and elytra with eyespots located exactly as in the typical form, but somewhat more strongly impressed and well separated. The scales in the central part of the spots brilliant blue, the broad marginal rim metallic golden green.

Male, length, 12 millimeters; width, 4.5. Female, length, 15 millimeters; width, 6.

LUZON, Nueva Vizcaya Province, Imugan (Baker).

One specimen, a male, of this beautiful local race of *P. congestus* I received through the kindness of Professor Baker; the type specimen I examined in the Dresden Museum.

Pachyrrhynchus congestus subsp. *ocellatus* subsp. nov. Plate 5, fig. 17, ♂.

Glossy black, prothorax and elytra with the eyespots relatively small and more roundish. The central part of the spots dark blue, the narrow marginal rim porcelain white.

Male, length, 15 millimeters; width, 5.8. Female, length, 16 millimeters; width, 7.

LUZON, Benguet Subprovince, settlement Bokod near Mount Pandan (Schultze).

Pachyrrhynchus viridans Heller. Plate 7, fig. 6, ♀.

Pachyrrhynchus viridans HELLER, Philip. Journ. Sci. § D 7 (1912) 318.

Black, moderately glossy, prothorax and elytra with pale greenish or bluish green scale spots. Rostrum in basal half with a broad dorsal depression with an indistinct longitudinal groove and a faintly indicated transverse groove at base between eyes. Prothorax as long as broad, greatest width before the middle, rather strongly constricted at base. Toward each side dorso-laterally at anterior margin a squarish spot, dorsally at base a triangular spot, and at lateral margins a large oblong scale spot. Elytra oblong-ovate, very finely coriaceous. Each elytron with eleven or twelve elliptical or roundish scale spots and two sutural spots: Two at base; four forming an irregular transverse row before the middle, of which the second and fourth or marginal spots, are located more posteriorly; another irregular cross row of four spots behind the middle, of which the second and fourth or marginal spots are located slightly forward; and a more or less triangular spot near apex. The two marginal spots are sometimes confluent, forming an elongated spot in the middle. The sutural spots are located, one slightly behind the middle, the other at apical fourth. Underside with the scale markings as in *P. sarcitis* Behr. Femora with a scale spot near apex.

Male, length, 17.5 millimeters (without rostrum); width, 7. Female, length, 19.5 millimeters (without rostrum); width, 8.2.

CALAYAN, Babuyan group (*McGregor*).

The number of elytral spots in this species seems to be somewhat variable. The general position of the spots is almost identical with that in *P. chlorites* Chevr., but by its size and different shape *P. viridans* can be readily distinguished.

Four specimens before me were collected together with the type (ex coll. Bureau of Science) in December, 1903, by my friend Mr. McGregor, who was involuntarily detained for over six months at the above-named lonesome island.

Pachyrrhynchus chlorites Chevr. Plate 3, fig. 9, ♂ (lateral view); Plate 7, fig. 8, ♀.

Pachyrrhynchus chlorites CHEVR., Le Naturaliste (1881) 360; HELLER, Philip. Journ. Sci. § D 7 (1912) 308, pl. 1, fig. 23.

Pachyrrhynchus rutilans BEHR., Stett. Ent. Zeitg. 48 (1887) 247; KRAATZ, Deutsche Ent. Zeitschr. (1888) 29.

Glossy dark purplish coppery, prothorax and elytra with very pale greenish yellow scale spots. Rostrum dorsally in

basal half with a strongly pronounced triangular roundish depression, at base between eyes with a distinct transverse groove. Rostrum and head without any scale spots. Prothorax as long as broad, toward each side, dorsolaterally; at anterior margin with a large transverse spot, dorsally at base with another, more triangular spot, and at lateral margins with a large oblong spot. Elytra oblong-ovate, elytron with eleven roundish scale spots and two spots at suture. The spots, in respect to their relative positions, are located exactly the same as in *P. congestus* subsp. *caerulans* Kraatz, but they are mostly larger in the latter. Mesosternum, metasternum, and first and second abdominal sternites with a large spot laterally. Femora with a dorsally interrupted ring spot near apex.

Male, length, 15 millimeters (without rostrum); width, 6.3. Female, length, 15.3 millimeters (without rostrum); width, 7.

CALAYAN, Babuyan group (McGregor).

A large number of specimens, which show very little variation, were collected by Mr. McGregor at the above locality.

Pachyrrhynchus morio Heller. Plate 3, fig. 6 (lateral view); Plate 9, fig. 10, ♂.

Pachyrrhynchus morio HELLER, Philip. Journ. Sci. § D 7 (1912) 318.

Black; head and prothorax glossy, elytra dull, finely coriaceous, with grayish or nearly colorless scale spots, most nearly related to *P. congestus* Pasc. Rostrum dorsally in the middle of apical half depressed, basal half with a deep squarish depression, the dorsolateral edges of rostrum strongly swollen. Prothorax slightly longer than broad, with a scale spot toward each side at anterior margin, another large spot dorsally at base, and an oblong spot at lateral margins. Each elytron with two large roundish spots at base, three spots in apical third, and two bifid sutural spots behind the middle and near apex. Besides these spots, there is sometimes a marginal spot in the middle.

Male, length, 14.5 millimeters (without rostrum); width, 5.5. Female, length, 15.6 millimeters (without rostrum); width, 6.6.

LUZON, Benguet Subprovince, Mount Lusong (*M. Ramos*).

The species seems to be rather variable; the sutural spots are wanting in some specimens.

Pachyrrhynchus gemmatus Waterh. Plate 1, fig. 19, ♀; Plate 6, fig. 13, ♂.

Pachyrrhynchus gemmatus WATERH.,¹² Proc. Ent. Soc. London (1841) 18; Ann. & Mag. Nat. Hist. I 3 (1841) 218; Trans. Ent. Soc. London I 3 (1843) 311; SCHOENH., Gen. Curc. Suppl. 3 (1845) 382; BEHR., Stett. Ent. Zeitg. (1887) 244; KRAATZ, Deutsche Ent. Zeitschr. (1888) 32; HEYDEN, 42. Ber. Senkenb. Naturf. Ges. (1911) 84, pl. 1, fig. 6; HELLER, Philip. Journ. Sci. § D 7 (1912) 308.

Pachyrrhynchus gemmatus var. β WATERH., Proc. Ent. Soc. London (1841) 18; Trans. Ent. Soc. London I 3 (1843) 311.

Pachyrrhynchus gemmatus var. β BEHR., Stett. Ent. Zeitg. (1887) 244.

Pachyrrhynchus gemmatus var. *atratus* HELLER, Philip. Journ. Sci. § D 7 (1912) 308.

General color glossy dark purplish or coppery to black. Prothorax and elytra with large roundish or oval eyespots, which are beset with very brilliant scales of various hues, those in the central area mostly golden green, and those on the outer portion red or of a metallic coppery hue. Rostrum with a large depression on basal half and a fine longitudinal median groove therein. A bifid scale spot on the depression. Another shallow depression on the front beset with a large roundish spot. Sides of rostrum and head also with a patch of scales. Prothorax as long as broad, the greatest width before the middle, with three large spots dorsally, of which two are located toward the sides dorsolaterally and about midway between fore and hind margins, and one oblong spot in the middle at hind margin. Another very large spot at each lateral margin. Elytra short-ovate, strongly inflated. Each elytron with seven to ten mostly large spots and two sutural spots on apical half. Two spots are located at base, three form a regular cross row before the middle, one oblong spot at margin, three other spots form a triangular figure in apical half, and one somewhat triangular spot is located at apex. Underside of mesosternum and metasternum laterad as well as abdominal sternites, except the last

¹² Sp. 2. *Pachyrrhynchus gemmatus*, W. Niger vel cupreus, laevis; capite supra maculis duabus, thorace supra tribus, infra duabus, et elytris sexdecim (duabus apud suturam) ornatis; his maculis a congerie squamarum metallice splendentium effectis; squamis centralibus nitidè viridibus, circumgirantibus aureo-rubris, et indè ocellos efficientibus.

Var. β differt elytris maculis viginti-duabus ornatis.

sternite, with patches of brilliant scales. Femora with a sub-apical scale ring interrupted above.

Male, length, 14 millimeters (without rostrum); width, 6.3. Female, length, 15.5 millimeters (without rostrum); width, 7.5.

LUZON, Cagayan Province, Sanchez Mira (*Schultze*), and several specimens from northern Luzon without exact locality.

This species is variable in respect to the number and size of the spots on elytra. Waterhouse describes it as having from sixteen to twenty spots and mentions his var. β with twenty-two spots.

Behrens redescribed this species with twenty-two spots and mentioned a var. β with sixteen spots, contrary to Waterhouse, and Kraatz gives the following constellation formula: "9 (1 scutellari, 2 et 3 disc., 3 lat.), majoribus, ocellatis, sp. major purpurea..... gemmatus Waterh."

The var. *atratus* Heller is based on a specimen with black as the general color.

Pachyrrhynchus gemmatus subsp. *purpureus* Kraatz. Plate 7, fig. 3, ♀.

Pachyrrhynchus purpureus KRAATZ, Deutsche Ent. Zeitschr. (1888) 31; HELLER, Philip. Journ. Sci. § D 7 (1912) 308.

Glossy, very dark purplish red, prothorax and elytra with brilliant light green scale spots, mostly much smaller than in typical *P. gemmatus*. Prothorax with the dorsolateral spots located nearer the middle. Each elytron with seven or eight oval or roundish spots and two bifid spots at suture. Two oval spots at base, two or three roundish spots forming a cross row before the middle, two others at apical third, the marginal one of which is oblong, and one other spot at apex. The first sutural spot in the middle is usually large and oblong, the second sutural spot at apical fourth is usually small.

Male, length, 13.5 millimeters (without rostrum); width, 5.6. Female, length, 14 millimeters (without rostrum); width, 6.3.

LUZON, Cagayan Province, Sanchez Mira (*my collector*).

By the general form and different aspects this subspecies may be readily distinguished from typical *P. gemmatus* Waterh.

Pachyrrhynchus taylori Schultze. Plate 2, fig. 15, ♀ (lateral view); Plate 7, fig. 11, ♀.

Pachyrrhynchus taylori SCHULTZE, Deutsche Ent. Zeitschr. (1922) 37, pl. 1, fig. 1, ♀.

Related to *P. gemmatus* Waterh. but larger and relatively slenderer in build. Very glossy dark purplish with a violet

sheen and large, very brilliant eyespots on prothorax and elytra. Rostrum toward apex distinctly divergent, broader than at base. Basal half with a broad dorsal impression beset with a large golden, usually bifid (by a fine and indistinct groove), somewhat triangular scale spot. Front with a shallow depression bearing a more roundish spot, still another spot at sides of rostrum and head. Prothorax a little longer than broad, the greatest width before the middle. Dorsally at hind margin a subtriangular scale spot, toward each side near anterior margin an elliptical or roundish spot, and on the lateral margins a still larger oblong scale spot. Elytra in the female rather broad and short-ovate, in the male slenderer, with sixteen more or less roundish eyespots, seven of which are located on each elytron, and two at suture are common to both elytra. Two spots at base, two at the middle, one oblong spot at outer margin extending backward beyond the middle, two at apical third, and two spots in apical half at suture. Scales in the outer marginal region of the spots reddish golden, the central part lighter and darker blue and green, glistening brilliantly like precious stones. In the male the spots are usually smaller than in the female; some male specimens have, besides the above-mentioned spots, a small roundish spot dorsolaterally in the middle and another toward each side between the sutural spots. Underside of mesothorax, metathorax, and first abdominal sternite laterad with a scale spot. Femora with scale spot apically below.

Male, length, 15.8 millimeters (without rostrum); width, 6.8. Female, length, 17 millimeters (without rostrum); width, 8.

LUZON, Kalinga Subprovince, Balbalan (*Taylor; Herre*). Because of its striking coloration, *Pachyrrhynchus taylori* is the most conspicuous species of the genus known to me. Mr. Taylor informs me that among the Kalingas this species is well known as *kokóng*.

Recently I received through Doctor Herre several more specimens of this species; among them were two males in which the color of the spots is exactly the same as in the females. In my original description I considered as the male of *P. taylori* a specimen which has the spots very large and of a more uniform color. Upon careful examination I now find that this specimen is not the male of typical *taylori*, but represents a well-differentiated subspecies of that species. This particular specimen was, as Mr. Taylor informs me now, probably collected not at Balbalan but on Mount Polis. Lately I received through Doctor Herre,

also from Mount Polis, a female which agrees perfectly with the above-mentioned male.

Pachyrrhynchus taylori subsp. *metallescens* subsp. nov. Plate 2, fig. 14, ♂ (lateral view); Plate 7, fig. 12, ♂.

Pachyrrhynchus taylori SCHULTZE, Deutsche. Ent. Zeitschr. (1922) 37, part., pl. 1, fig. 2, ♂.

Spots on head, prothorax, and elytra much larger than in typical *Pachyrrhynchus taylori*. Spots more uniform metallic reddish golden in the male, and in the female greenish golden. Spots in the male are so large that they touch each other; in the female they approach each other closely. Form of elytra in both sexes rather regular oblong-ovate, but slenderer in the male. Penis structure similar in general shape, but slightly broader than in typical *P. taylori*.

Male, length, 17.5 millimeters (without rostrum); width, 6.5. Female, length, 17.5 millimeters (without rostrum); width, 8.3.

LUZON, Ifugao Subprovince, Polis Pass (*Taylor; Herre*).

Pachyrrhynchus sanchezi Heller. Plate 2, fig. 16, ♀ (lateral view); Plate 6, fig. 15, ♀; fig. 16, ♂.

Pachyrrhynchus sanchezi HELLER, Philip. Journ. Sci. § D 7 (1912) 319, pl. 2, fig. 10, ♂.

Glossy black with large scale spots which are brilliant green or blue, glimmering like precious stones in the male; in the female the spots are uniform blue. Rostrum in apical half very finely and scatteredly punctured, basal half with a large and oblong depression reaching to front. A bifid triangular scale spot in the depression, divided by a fine median line. Front with a roundish spot, sides of rostrum and head also with a patch of scales. Prothorax longer than broad, the greatest width before the middle. Dorsally at posterior margin a large subtriangular scale spot, before the middle toward each side a large roundish spot, and at each lateral margin a very large oblong scale patch. Elytra in the male oblong-elliptical, in the female short-ovate. Each elytron with seven large scale spots and two sutural spots in apical half located as follows: Two spots at base; three form a cross row at middle, of which the marginal one is very large and directed backward; two in apical third; and two at suture. Underside of mesothorax, metathorax, and first abdominal sternite laterally with a large scale patch. Femora with a scale spot on underside near apex. Penis structure, Plate 3, fig. 20.

Male, length, 11 to 12.5 millimeters (without rostrum); width, 5 to 6.2. Female, length, 15 to 16 millimeters (without rostrum); width, 7 to 7.5.

LUZON, Benguet Subprovince, Baguio; Mount Mirador; Mount Santo Tomas; Mountain Trail from Baguio to near kilometer 30.

From the above localities I obtained a number of specimens, some of them in copula; but this species seems to be rather rare. In my experience in collecting this species I found that perfect specimens with reference to the scale coloration are rare and it appears that the scales wear off very easily. In *P. sanchezi* Heller it is noteworthy that the scale coloration of the markings in the male, being brilliant and glimmering green, differs from that of the female, which is uniform blue. In the Deutsche Entomologische Museum at Berlin I located a female specimen labeled *P. immarginatus* Kraatz, which was very old and in a worn state, that belongs to this species.

Pachyrrhynchus benguetanus sp. nov. Plate 3, fig. 10 (lateral view); Plate 7, fig. 2, ♂.

Glossy black, prothorax and elytra with roundish uniform dark blue spots. Rostrum dorsally in basal half with a broad depression and an indistinct medial groove, the depression confluent with another, shallower and more roundish depression on front, both depressions bearing a large scale spot. Sides of rostrum and head also with a large blue scale spot. Prothorax longer than broad, toward each side dorsolaterally a small roundish scale spot and dorsally at base another oblong spot, these spots sometimes entirely absent or only indicated by traces. Sides with a large oblong spot. Elytra with indistinct traces of puncture rows; position of spots similar to that in *P. sanchezi* Heller but spots very much smaller. Each elytron with eight spots and one small sutural spot in the middle. Two spots at base, three forming a cross row before the middle, of which the first dorsolateral spot is usually very small, sometimes entirely absent; a large marginal spot slightly behind the middle, a roundish spot at apical third, and another spot near apex. Underside marked very similarly to that of *P. sanchezi*. Femora with an indistinct spot near apex.

Male, length, 13.6 millimeters (without rostrum); width, 6.5. Female, length, 13.2 millimeters (without rostrum); width, 7.

LUZON, Benguet Subprovince (*Baker*).

The elytra of this species are relatively shorter than in *P. congestus* Pasc. The number of spots in *P. benguetanus* seems

to be rather variable, since in one specimen no sutural spot is present; in another specimen on each elytron the two spots nearest to apex are also missing.

Pachyrrhynchus sarcitis Behr. Plate 3, fig. 2, ♀ (lateral view); Plate 7, fig. 4, ♀.

Pachyrrhynchus sarcitis BEHR., Stett. Ent. Zeitg. 48 (1887) 246;
KRAATZ, Deutsche Ent. Zeitschr. (1888) 32; HELLER, Philip.
Journ. Sci. § D 7 (1912) 308, pl. 1, fig. 22.

Glossy black, prothorax and elytra with pale green or pale flesh-colored scale spots. Rostrum dorsally in basal half with an oblong depression which is confluent with another depression on front. Both depressions with a larger and a smaller spot, bifid by an indistinct medial carina. Another scale spot at sides of rostrum and head. Prothorax as long as broad, the greatest width slightly before the middle, very minutely punctate. Toward each side dorsolaterally, but before the middle, a rather squarish spot, and dorsally at base a large subtriangular spot. Lateral margins with a scale stripe reaching from anterior to posterior margin. Elytra ovate; each elytron with eight roundish or oval spots and two bifid spots at suture. Two oval spots at base, three roundish spots form a transverse row before the middle, a large oblong marginal spot in the middle, another large roundish spot dorsolaterally in apical third, and a large apical spot. The bifid sutural spots are located, one behind the middle, the other at apical fourth. Mesosternum, metasternum, and first and second abdominal sternites with a large spot laterally. Femora with a spot near apex.

Male, length, 15 millimeters (without rostrum); width, 6.6. Female, length, 17.3 millimeters (without rostrum); width, 7.5.

CALAYAN, Babuyan group (*McGregor*).

Professor Kraatz placed this species in his group 5 as not having a dorsal spot at the base of the prothorax, which is in disagreement with Behrens's original description.

Pachyrrhynchus lorquini Chevr. Plate 3, fig. 8 (lateral view); Plate 8, fig. 2.

Pachyrrhynchus lorquini CHEVR., Le Naturaliste (1881) 360;
HELLER, Philip. Journ. Sci. § D 7 (1912) 308, pl. 1, fig. 24.

Pachyrrhynchus flavopunctatus KRAATZ, Deutsche Ent. Zeitschr. (1888) 30.

Pachyrrhynchus flavomaculatus KRAATZ, Deutsche Ent. Zeitschr. (1888) 32.

Glossy black with a violet sheen, prothorax and elytra with pale reddish or ochraceous scale spots. Body form very similar

to that of *P. congestus* Pasc. Rostrum in basal half with a short shallow triangular depression. Prothorax longer than broad, greatest width before the middle. At anterior margin toward each side dorsolaterally a roundish scale spot and a large spot dorsally at base. A broad stripe at lateral margins. Elytra with two oblong sutural spots, one at the middle, the other at apical fourth. Each elytron furthermore with seven oblong-oval spots; one at the base, three forming an irregular cross row before the middle, three others behind the middle; and a broad marginal stripe reaching from base to apex. The marginal stripe is sometimes interrupted, forming three or four oblong spots. Anterior coxæ with a scale spot. Mesosternum, metasternum, and first and second abdominal sternites with a scale spot laterally. Legs glossy bluish black with a scale spot near apex.

Male, length, 13 millimeters (without rostrum); width, 5.2. Female, length, 16 millimeters (without rostrum); width, 6.

LUZON, Laguna Province, Mount Maquiling (*Baker*).

This species is described from a specimen collected by Lorquin at Maldonado (?) which locality is unknown to me in the Philippines. The species is easily recognized by the peculiar coloration of the scale markings.

Pachyrrhynchus dohrni Behrens. Plate 8, fig. 15.

Pachyrrhynchus dohrni BEHRENS, Stett. Ent. Zeitg. 48 (1887) 236; HEYDEN, 42. Ber. Senkenb. Naturf. Ges. (1911) 84, pl. 1, fig. 8; HELLER, Philip. Journ. Sci. § D 7 (1912) 306.

Glossy dark purplish coppery, prothorax with brilliant greenish or reddish golden scale markings. Rostrum in basal half with a shallow triangular depression. Prothorax slightly broader than long, subspherical, more constricted near base. Dorsally with a triangular spot at base, at anterior margin toward each side dorsolaterally a roundish spot, and at lateral margins an oblong longitudinal spot. Elytra ovate, near the lateral margins and apex indistinctly striate-punctate. Each elytron with four broad longitudinal scale stripes, an apical spot and two small oblong sutural spots behind the middle and near apex. The first or dorsal and the fourth or marginal stripes longest, reaching from base to near apex. The second stripe dorsolaterally, the shortest, is much abbreviated and only about half as long as the first. The third stripe is slightly shorter than the fourth. The scale coloration of the stripes is very brilliant, glistening with greenish or reddish coppery reflections. Mesosternum, metasternum, and first and second

abdominal sternites with scale patches laterally. Femora with a small scale spot on underside near apex.

Pachyrrhynchus dohrni var. β Behrens.

Pachyrrhynchus dohrni var. β BEHRENS, Stett. Ent. Zeitg. 48 (1887) 236.

Elytra without the posterior sutural spot.

Length, 15 to 19 millimeters; width, 5.5 to 8.

Philippines (*Semper*); exact locality unknown.

GROUP IX

This group contains at present only two species and is typified by *Pachyrrhynchus eques* Heller. Both species are characterized by the peculiar general coloration of the elytra, which is dull or glossy burnished, reddish or greenish bronze.

Key to the species of Pachyrrhynchus, Group IX.

α^1 . Without any scale markings..... *P. sumptuosus* Schultze.

α^2 . Prothorax and elytra with light blue scale spots..... *P. eques* Heller.

Pachyrrhynchus eques Heller. Plate 8, fig. 3.

Pachyrrhynchus eques HELLER, Philip. Journ. Sci. § D 7 (1912) 312, pl. 1, fig. 21.

Dull reddish or greenish bronze, legs coppery, elytra with light blue scale spots. Rostrum with the dorsal depression rather shallow. Prothorax as long as broad, smooth and glossy, with a small scale spot at lateral margins. Elytra ovate and impunctate. Each elytron with two roundish basal spots and five smaller spots in apical third, of which four form an irregular transverse row, the other being located near apex. Another small bifid sutural spot slightly behind the middle. Mesosternum, metasternum, and first and second abdominal sternites with scale patches laterally. Femora with a spot on underside near apex.

Female, length, 19 millimeters; width, 7.8.

LUZON, Cagayan Province, Abulog River (*McGregor*).

This species is known to me only from the type specimen (ex coll. Bureau of Science) in the Zoölogical Museum of Dresden.

Pachyrrhynchus sumptuosus Schultze. Plate 3, fig. 4, ♀ (lateral view); Plate 5, fig. 5.

Pachyrrhynchus sumptuosus SCHULTZE, Philip. Journ. Sci. § D 12 (1917) 250.

Head, prothorax, legs, and underside glossy black, with a coppery luster. Elytra dull glossy, iridescent purplish brown

or green. Rostrum finely and sparsely punctured, a prominent pitlike depression in basal half. In the depression a rather indistinct longitudinal groove. Prothorax with an indistinct groove near fore margin, laterally only. Hind margin raised. Female with a group of very minute bronze green scales at lateral margin. Each elytron with a row of punctiform impressions near outer margin, extending from middle to apex. In apical part these depressions run together, forming a groove. Femora with a strongly excavated depression below, apically. At the depression minutely fine scales and hair. Tibia below very minutely denticulate and beset with fine hair. Penis structure, Plate 3, fig. 21.

Male, length, 12.5 millimeters (without rostrum); width, 5. Female, length, 16 millimeters (without rostrum); width, 7.

LUZON, Kalinga Subprovince, Lubuagan and Balbalan (Taylor).

This species is easily recognized by the very peculiar general coloration of the elytra, which indicates its relation to *P. eques* Heller.

GROUP X

This group is typified by *Pachyrrhynchus inclytus* Pascoe. Large species, general color dark green, dark glowing red, or black. Prothorax and elytra mostly with prominent longitudinal, exceptionally with transverse, scale stripes. This group corresponds mainly, with some exceptions and additions, to Heller's second group.

Key to the species of Pachyrrhynchus, Group X.

- a*¹. Elytra black with a transverse band in the middle.
 - b*¹. Elytra with the narrow dorsal longitudinal stripes not interrupted, entire *P. möllendorffi* Heller.
 - b*². Elytra with the dorsal longitudinal stripes interrupted before and behind the transverse band in the middle..... *P. semperi* Heller.
- a*². Black, dark green, or glowing red, without an entire transverse band in the middle, but mostly with longitudinal stripes.
 - c*¹. Dark glowing red, each elytron with four moderately broad longitudinal stripes, traces of a more or less interrupted sutural scale line, and narrow interrupted secondary stripes.
 - P. pulchellus* Behrens.
 - c*². Elytra with a transverse row of spots in the middle.
 - P. pulchellus* var. *bakeri* Heller.
 - c*³. Elytra with three rather broad longitudinal stripes.
 - P. pulchellus* var. *modestioroides* Schultze.
- d*¹. Dark green or black, each elytron with three longitudinal stripes.
 - e*¹. Dark green, prothorax with a dorsobasal triangular spot and toward each side a short longitudinal stripe extending from

base forward to beyond the middle, where it is usually expanded spotlike. Each elytron with three rather broad longitudinal stripes. In the middle between the stripes two or three spots indicating a rudimentary transverse band.

P. inclytus Pascoe.

*e*². Each elytron with three broad stripes but without any spots in the middle..... *P. inclytus* var. *modestior* Behrens.

*f*¹. Prothorax with the dorsolateral abbreviated stripes connected by a short transverse stripe. Elytra with a more or less interrupted crossband at the middle.

P. inclytus var. *transversatus* Heller.

*f*². Black; prothorax dorsolaterally in the middle with or without an indistinct small roundish spot. Each elytron with three narrow stripes..... *P. igorota* Schultze.

*d*². Black; each elytron with more than three longitudinal stripes, the latter more or less interrupted.

*g*¹. Prothorax with a band along anterior margin and dorsally at hind margin another bandlike marking composed of two transverse spots, dorsolaterally near the middle with two small round spots. Each elytron with five broad stripes, the sutural one abbreviated at base..... *P. loheri* Schultze.

*g*². Prothorax with two large dorsolateral spots at anterior margin, two small dots at the middle, and two others at base. Each elytron with two sutural spots at the middle and near apex, and four stripes, the first and second mostly interrupted, abbreviated near base..... *P. psittaculus* Heller.

*h*¹. Elytra without distinct stripes.

*h*². Elytra with a sutural spot at the middle and near apex. A large irregular scaled area at basal third extending laterally to, and expanding again at, apical third.

P. psittacinus Heller.

Pachyrrhynchus pulchellus Behr. Plate 1, fig. 13, ♀ (lateral view); Plate 4, fig. 14, ♀.

Pachyrrhynchus pulchellus BEHR., Stett. Ent. Zeitg. 48 (1887) 238; KRAATZ, Deutsche Ent. Zeitschr. (1888) 32; HELLER, Philip. Journ. Sci. § D 7 (1912) 306.

Pachyrrhynchus bakeri HELLER, Philip. Journ. Sci. 19 (1921) 542.

Pachyrrhynchus bakeri var. *modestioroides* SCHULTZE, Philip. Journ. Sci. 21 (1922) 576.

Dark glowing red, glossy, with pale bluish green longitudinal stripes. Nearly related to *P. inclytus* Pasc. Rostrum with a strongly pronounced, somewhat triangular depression in basal half which is confluent with a shallow depression on front. The latter with a small round scale spot. Sides of rostrum and head with an oblong patch of scales. Prothorax broader than long, the greatest width before the middle. At anterior margin toward each side a wedge-shaped spot and two other elongate

spots at hind margin, the former and latter sometimes confluent. Sides with a longitudinal stripe. Elytra oblong-oval, glowing or coppery red. Each elytron with four longitudinal stripes, and with a more or less fragmentary scale line along suture in apical half. The first dorsal stripe and the fourth or marginal stripe reach from base to apex, at which place they are confluent. The second and third stripes reach from base to apical fourth and there join each other. Underside of prothorax, mesothorax, and metathorax with scale patches, the first three abdominal sternites with spots laterally. Femora with a scale spot on underside near apex. Penis structure, Plate 3, fig. 38.

Male, length, 12.8 to 14.5 millimeters (without rostrum); width, 5 to 5.8. Female, length, 14 to 16 millimeters (without rostrum); width, 5.8 to 7.

LUZON, Benguet Subprovince, Baguio; Mount Mirador; Mount Santo Tomas; Trinidad; Mountain Trail from Baguio to kilometer 88; Mount Polis (*Schultze*).

This species is also quite variable, especially in the width of the stripes. The latter are in some specimens very narrow, like lines (from Pauai, Benguet, at Haight's place, 2,400 meters) and only in rare instances the stripes attain the same width as in *P. inclytus*. In some specimens of *P. pulchellus* small elongate spots are present between the stripes in apical half of elytra; in some cases such spots are located only in the middle, forming a cross row. The latter form I consider to be var. *bakeri* Heller, Plate 8, fig. 5. It resembles somewhat *P. gloriosus* Faust. From Mount Polis I received specimens which I described as *P. pulchellus* var. *modestioroides* Schultze; this variation has on each elytron only three relatively broad stripes and on that account resembles *P. inclytus* Pasc., but may be distinguished readily from the latter by the smaller size, other ground color, and the different markings on the prothorax.

Pachyrrhynchus inclytus Pasc. Plate 1, fig. 12, ♀ (lateral view); Plate 4, fig. 13, ♀ (var. *modestior* Behr.).

Pachyrrhynchus inclytus PASC., Journ. Linn. Soc. London 11 (1873) 155; BEHR., Stett. Ent. Zeitg. 48 (1887) 242; HELLER, Philip. Journ. Sci. § D 7 (1912) 306; SCHULTZE, Philip. Journ. Sci. 21 (1922) 577; 23 (1923) 78.

Pachyrrhynchus modestior BEHR., Stett. Ent. Zeitg. 48 (1887) 240, var. β, op. cit. 241, var. γ, l. c., var. δ, l. c.; KRAATZ, Deutsche Ent. Zeitschr. (1888) 26; HEYDEN, 42. Ber. Senkenb. Naturf. Ges. (1911) 84, pl. 1, fig. 5; HELLER, Philip. Journ. Sci. § D 7 (1912) 306.

Pachyrrhynchus modestior var. *apicalis* KRAATZ, Deutsche Ent. Zeitschr. (1888) 26.

Pachyrrhynchus modestior var. *transversatus* HELLER, Philip. Journ. Sci. 19 (1921) 544.

Glossy dark green, elytra with pale green longitudinal scale stripes. Nearly related to *P. pulchellus* Behr. Rostrum in apical half scatteredly punctate and with a shallow depression, basal half with a strongly pronounced depression. Front with a large oblong-triangular scale spot. Sides of rostrum and head also with an oblong spot. Prothorax as long as broad, the greatest width at the middle. A wedge-shaped spot in the middle at hind margin and laterad of it a short, slightly curved longitudinal stripe reaching forward to beyond the middle where it is expanded spotlike. Another broad stripe at lateral margins. Elytra oblong-ovate, very finely coriaceous, each elytron with three longitudinal stripes. A subsutural and a marginal stripe reaching from base to apex, confluent at the latter place. Another stripe intermediate between the two, not reaching apex. In the middle, near suture and between the first and second stripes, some spots that form a rudimentary crossband. Sometimes a small spot between first and second stripes in apical fourth (var. δ Behr. and var. *apicalis* Kraatz). Femora with large scale spots near apex. Penis structure, Plate 3, fig. 37.

Male, length, 13.5 to 17 millimeters (without rostrum); width, 5.5 to 7.5. Female, length, 16 to 19 millimeters (without rostrum); width, 7 to 8.5.

LUZON, Benguet Subprovince, Baguio; Mount Mirador; Mount Santo Tomas; Trinidad; Mountain Trail from Baguio to rest house, kilometer 58: Nueva Vizcaya Province, Imugan (*Schultze*).

I consider specimens in which the spots in the middle of elytra are wanting to be var. *modestior* Behr. The typical form of *P. inclytus* Pasc. is identical with *P. modestior* var. γ Behrens. Still another form is var. β Behr. (thorace antice plaga connectiva inter vittas laterales), being similar to *P. modestior* var. *transversatus* Heller; finally, var. δ Behr. and var. *apicalis* Kraatz are identical.

Pachyrrhynchus inclytus is found mostly in the same localities as *P. pulchellus* Behr., but seems to be rarer. It is readily distinguishable from the latter by the abbreviated stripes on the prothorax as well as by the triangular spot in the middle at

base. In systematic relation *P. inclytus* stands between *P. pulchellus* Behr. and *P. igorota* Schultze.

Pachyrrhynchus igorota Schultze. Plate 1, fig. 11, ♂ (lateral view); Plate 4, fig. 16, ♀.

Pachyrrhynchus igorota SCHULTZE, Philip. Journ. Sci. § D 12 (1917) 251, pl. 1, fig. 2, ♀; 21 (1922) 593, pl. 4, fig. 1.

Dull glossy, black. Rostrum apically broader than at base. Apical area densely punctured. Rostrum transversely set off at the middle, posterior of which is a deep depression, the lateral edges of which are strongly produced. A creamy white scale spot posterior of antennal groove. Prothorax as long as broad. Laterad of the middle an irregular spot composed of a few scales and posteriorly of the latter at hind margin a wedge-shaped spot. A longitudinal lateral fascia from fore to hind margin. Each elytron with three longitudinal narrow creamy white stripes: One from base straight across disk to apex; another laterad, beginning a short distance from base and terminating a short distance before apex; and another broad outer marginal stripe also arising some distance from base and terminating before apex. Prosternum and mesosternum with a triangular spot between coxæ, the latter also with a spot laterad. Metasternum and first abdominal segment with a lateral spot only. Femora with a spot on underside near apex. Penis structure, Plate 3, fig. 22.

Male, length, 18 millimeters (without rostrum); width, 7. Female, length, 20 millimeters (without rostrum); width, 8.5.

LUZON, Benguet Subprovince, Pauai (Haight's place), 2,400 meters; Mount Pulog (*Schultze*).

The males of this species have the spots on prothorax mostly very much reduced or entirely absent. Also the stripes on elytra, with the exception of the one at lateral margin, are sometimes interrupted in the middle. In one specimen the second stripe is reduced to one-fourth the normal length basally. This species is mostly covered with a sticky substance, so that it is very difficult to obtain perfectly clean specimens. Whether this is due to a kind of natural perspiration or to certain peculiarities of the food plant with which the insect comes in contact, I am unable to say at present.

The range of this species seems very limited. It is closely related to *P. inclytus* Waterh., but is easily distinguished from the latter by the usually larger size, the narrower stripes on

the elytra, and the absence of a spot between the eyes. The color of *P. inclytus* is mostly dark glossy green, but in all the specimens of *P. igorota* that were examined the color is dull glossy black.

Pachyrrhynchus loheri Schultze. Plate 1, fig. 14 (lateral view); Plate 4, fig. 15, ♀.

Pachyrrhynchus loheri SCHULTZE, Philip. Journ. Sci. § D 12 (1917) 252, pl. 1, fig. 3, ♀.

Glossy black, elytra with very broad, light green, longitudinal scale stripes. Rostrum comparatively short, transversely set off and emarginate in the middle. Apical part densely punctured, in basal part a deep depression with a scale spot, the lateral edges prominently produced. Front with a punctiform impression. Prothorax longer than broad. A broad band at anterior margin, which narrows toward sides, but continues to hind margin where it terminates laterad in a shallow depression. Hind margin dorsad with a broad band composed of two elongated, closely approximated spots. Somewhat behind the middle, laterad, a shallow depression with a nearly round scale spot. From the latter to posterior margin a slightly raised keel. Elytra cordiform, broadest before the middle. Each elytron with five longitudinal stripes, which are broader than the interspaces, except the sutural stripes. The latter begin before the middle, becoming somewhat narrower and again broader toward apex. The second stripe unites with the marginal near apex. The interspaces are somewhat elevated. Abdominal sternites finely wrinkled like leather and with a few scattered scales. Femora with a spot near apex, entad.

Female, length, 18 millimeters (without rostrum); width, 8. LUZON, Bulacan Province, Mount Guinuisan (*A. Loher*).

From other related species *P. loheri* is easily distinguished by the cordate elytra.

Pachyrrhynchus psittaculus Heller. Plate 1, fig. 15 (lateral view); Plate 8, fig. 7, ♀.

Pachyrrhynchus psittaculus HELLER, Philip. Journ. Sci. 19 (1921) 543, pl. 2, fig. 6.

Glossy black, scale markings pale green, closely related to *P. loheri* Schultze. Rostrum with the dorsal depression well defined, transverse oval. Head and prothorax almost imperceptibly remotely punctate. Prothorax with an irregular more or less interrupted scale band at anterior margin, which is mostly

expanded spotlike dorsolaterally. A spot dorsolaterally in the middle and two small spots dorsally at base. Lateral margins with a larger or smaller scale band. Each elytron with four longitudinal stripes and two sutural spots near the middle and apex. The dorsal stripe is more or less interrupted, forming oblong spots, but in the type specimen it is confluent at apex with the marginal stripe. The second and third stripes are abbreviated basally and apically; furthermore, in the type specimen the second stripe is also interrupted in the middle. Underside, mesosternum, metasternum, and first and second abdominal sternites with a scale spot laterally. Femora with a spot near apex.

Female, length, 14 millimeters (without rostrum); width, 6.5.

LUZON, Laguna Province, Mount Banahao (*A. Duyag*).

Through my collector I received a single specimen (see Plate 1, fig. 15) of this species from the above-mentioned type locality, which varies somewhat from the type specimen, Plate 8, fig. 7.

Pachyrrhynchus psittacinus Heller. Plate 8, fig. 1.

Pachyrrhynchus psittacinus HELLER, Philip. Journ. Sci. § D 7 (1912)
317, pl. 1, fig. 16, ♂.

Glossy black, elytra with very large pale bluish green scale markings. Rostrum with a scale spot in the dorsal triangular depression, some scattered scales on side, another spot below eye. Prothorax longer than broad, greatest width before the middle, dorsally finely and scatteredly punctured. At anterior margin toward each side a lateral scale spot and a small spot dorsolaterally in posterior half. Surface of elytra beset with pale green scales, with the exception of the following bare markings: A sutural stripe, confluent with a broad irregular bare area in the middle, continued along suture to apex and as a stripe along outer margin; a small subsutural scale spot behind the middle and near apex; the scatteredly scaled area shows traces of narrow bare stripes, which seems to indicate that the large scaled configuration is the result of confluence of oblong spots or stripes. Femora with a scale spot apically.

Male, length, 15.2 millimeters; width, 6.

LUZON, Bataan Province, Lamao (*H. M. Cuzner*).

On account of its peculiar markings, this species is easily recognizable. The only specimen known so far (ex coll. Bureau of Science) seems to be the type, now in the Dresden Museum.

Pachyrrhynchus möllendorffi Heller. Plate 8, fig. 10.

Pachyrrhynchus möllendorffi HELLER, Abh. u. Ber. Königl. Zool. Anthr.-Ethnogr. Mus. Dresden 7 (1898-99) 5; Philip. Journ. Sci. § D 7 (1912) 305, pl. 1, fig. 18.

Black, glossy, head and legs coppery with a purplish sheen. Prothorax and elytra with pale green scale-stripe markings, very similar to *P. chevrolati* Eydoux and Souleyet. Rostrum dorsally in basal half with an almost squarish depression, which is more or less confluent with a shallow depression on front, the latter beset with a small scale spot. Apical part of rostrum also slightly depressed in the middle, so that the dorsolateral edges appear swollen. Sides of head with a small scale spot below eye. Prothorax broader than long, the greatest width before the middle, glossy, finely and scatteredly punctured. Toward each side dorsolaterally a longitudinal stripe reaching from base to anterior margin and continued anterolaterally, then again confluent with a longitudinal stripe at lateral margin, the latter reaching posterior margin. Elytra more oblong than in *P. chevrolati*, very finely striate-punctate. Each elytron with three longitudinal stripes, one dorsolaterally in the second interstice, another in the sixth interstice reaching only to the middle, and a marginal stripe which is confluent near apex with the dorsal stripe. At base a transverse stripe and in the middle another transverse stripe, more or less interrupted by the puncture rows, laterally confluent with the second longitudinal stripe. In apical fourth the first or dorsal stripe with a short, forward-curved branch reaching to seventh puncture row. Underside with scale markings as in *P. chevrolati*. Femora with a small scale spot on underside near apex.

Length, 15 millimeters; width, 6.5.

Philippines; exact locality unknown.

This species I know only from the type specimen in the Zoölogical Museum, Dresden.

Pachyrrhynchus semperi Heller. Plate 8, fig. 14.

Pachyrrhynchus semperi HELLER, Philip. Journ. Sci. § D 7 (1912) 314.

Glossy, black, prothorax and elytra with narrow pale reddish golden scale stripes. Rostrum in basal half dorsally with a well-pronounced triangular depression, bearing a transverse scale spot; laterally before eye with an elongate depression, so that the dorsolateral edges are distinctly swollen. Prothorax slightly longer than broad, at base more constricted than near apex,

very minutely and scatteredly punctate, with a narrow scale line at anterior and posterior margins, lateral margins with a longitudinal stripe confluent with the latter. Dorsolaterally a short fragmentary longitudinal stripe near posterior margin, not quite reaching latter. Elytra elongate-cordiform, toward apex indistinctly striate-punctate, the first row near apex depressed, apical part of first interstice swollen and rugulose. Basal half in third and seventh interstice with a longitudinal stripe, both stripes mostly connected at base but not reaching posteriorly up to a transverse stripe located slightly behind the middle. The transverse stripe is continued as a marginal stripe in apical half to near apex, where it recurves again and forms an abbreviated longitudinal stripe in the third interstice, not reaching the transverse stripe. Another apically abbreviated longitudinal stripe at apical half in the seventh interstice, confluent with the transverse stripe, and an elongate subsutural spot near apex. Mesosternum, metasternum, and first and second abdominal sternites with a scale patch laterally. Femora with a circular scale band near apex.

Female, length, 16.8 millimeters (without rostrum); width, 7. Philippines (*Semper*); exact locality unknown.

GROUP XI

The typical species for this small group is *Pachyrrhynchus gloriosus* Faust. Medium-sized species, general color dark glowing red or dark purplish coppery. Prothorax and elytra with scale stripes and more or less interrupted transverse bands.

Key to the species of Pachyrrhynchus, Group XI.

- a*¹. Elytra with the dorsal longitudinal stripe continuous to near apex, crossed in the middle by a transverse band..... *P. gloriosus* Faust.
- a*². Elytra with the dorsal longitudinal stripe interrupted, before and behind the transverse band.
 - b*¹. Prothorax with two dorsolateral longitudinal stripes.
 - c*¹. Elytra, dorsal stripe interrupted a short distance before and behind the transverse band. The latter interrupted only at suture.
 - P. nobilis* Heller.
 - c*². Elytra, dorsal stripe reduced to a spot at base and a short branch at apical third. Transverse band interrupted at suture and dorsolaterally forming a transverse spot.
 - P. gloriosus abbreviatus* Schultze.
 - b*². Prothorax with a medial and two dorsolateral longitudinal stripes; each elytron at base, besides the dorsal, with two abbreviated stripes, at apical triangle with one or two oval spots.... *P. cumingi* Waterh.

Pachyrrhynchus gloriosus Faust. Plate 1, fig. 26 (lateral view); Plate 4, fig. 7, ♀.

Pachyrrhynchus gloriosus FAUST, Stett. Ent. Zeitg. (1895) 7; HELLER, Philip. Journ. Sci. § D 7 (1912) 305, pl. 1, fig. 15.

Glossy dark coppery red, prothorax and elytra with pale green scale stripes. Rostrum in apical half finely and remotely punctate, basal half with a strongly pronounced triangular depression. Front mostly with a small scale spot, another spot at sides of rostrum and head. Prothorax slightly broader than long. Toward each side dorsolaterally a longitudinal stripe extending from base to and confluent with an anterior marginal stripe. The latter continued laterally and confluent with a lateral marginal stripe, which again is confluent with a short stripe laterally at posterior margin. Elytra stout-ovate, finely punctate-striate. Each elytron with three longitudinal stripes, the first dorsolaterally between the second and third puncture rows sometimes interrupted in the middle, reaching from base to apex; the second, laterally between the sixth and seventh puncture rows, is curved in apical fourth and becomes confluent with the first stripe; the third or lateral marginal stripe extends from base to apex where it is confluent with the first stripe. Furthermore, the elytra with a stripe at base and a transverse stripe at the middle. Apical fourth mostly with a small sutural spot. Prosternum and mesosternum beset with scales, metasternum and first abdominal sternite with a spot laterally. Femora with an oblong spot in the middle and another small spot on underside near apex. Penis structure, Plate 3, fig. 36.

Male, length, 13 millimeters (without rostrum); width, 5.8. Female, length, 13 millimeters (without rostrum); width, 6.3.

LUZON, Laguna Province, Mount Banahao (*Schultze*).

Pachyrrhynchus gloriosus subsp. *abbreviatus* Schultze. Plate 4, fig. 8, ♂.

Pachyrrhynchus gloriosus var. *abbreviatus* SCHULTZE, Philip. Journ. Sci. 21 (1922) 576.

Dark glowing red, the scale markings in the general design as in the typical form, but broader and abbreviated so as to form oblong spots. Prothorax dorsolaterally at base with a large oblong spot, sometimes another small spot dorsolaterally at anterior margin. Lateral margins with a large elongate scale patch. Each elytron with two oblong spots at base, and a transverse spot in the middle dorsolaterally, the latter being a fragmentary part of the transverse stripe. Lateral marginal stripe reduced at base, reaching from basal fourth to apex

where it is confluent with a short and abbreviated part of the first stripe. Laterally at the middle a short branch of the transverse stripe confluent with the marginal stripe.

LUZON, Bontoc Subprovince (*my collector*): Kalinga Subprovince, Lubuagan (*Herre*).

Based on one specimen, I considered this subspecies at first to be only a variation of *P. gloriosus* Faust. Recently, I received several more specimens which show rather strong and constant differential characters, distinguishing it from typical *P. gloriosus*. The prothorax is more subspherical, and the elytra are more oblong-oval in subsp. *abbreviatus*. Furthermore, the pale green scale markings are very brilliant.

Pachyrrhynchus nobilis Heller. Plate 8, fig. 12.

Pachyrrhynchus nobilis HELLER, Philip. Journ. Sci. § D 7 (1912) 313, pl. 2, fig. 9.

Purplish or violet coppery with sulphur or pale ochreous yellow stripes. Rostrum in the dorsal depression with a scale spot, the latter bifid by a medial groove. Sides of rostrum and head with an oblong spot. Prothorax subspherical, slightly broader than long, impunctate, with a scale line along anterior and posterior margins, and a longitudinal line at each lateral margin confluent with the latter. Toward each side dorsolaterally a short longitudinal line reaching from posterior margin forward to the middle. Elytra finely striate-punctate. At basal third an abbreviated longitudinal line at second and eighth interstices, which are confluent with a curved line at base, a transverse line at about the middle reaching laterally to the eighth puncture row, then bending backward to near apex where it is confluent with a short longitudinal line, in the second interstice, reaching forward to near the transverse line. In apical third, in the fourth and sixth interstices, a short abbreviated line and two small subsutural spots. Mesosternum and metasternum with a small scale spot laterally. Femora with a small spot on underside near apex.

Length, 11 to 14 millimeters; width, 5 to 6.8.

Philippines (*Semper*); exact locality unknown.

Pachyrrhynchus cumingi Waterh.

Pachyrrhynchus cumingi WATERH., Proc. Ent. Soc. London (1841) 19; Ann. & Mag. Nat. Hist. 8 (1841) 218; Trans. Ent. Soc. London I 3 (1843) 312; SCHOENH., Gen. Curc. Suppl. 8 (1845) 382; HELLER, Philip. Journ. Sci. § D 7 (1912) 309.

Glossy reddish coppery or dark greenish bronze, prothorax and elytra with pale green stripe markings.

I prefer to give here the original description of Waterhouse,¹³ since two specimens before me which I believe to be this species and which agree in practically all characters with *P. cumingi* seem to represent a variety on account of some minor differences in the markings.

Splendidè cupreus; elytris leviter punctato-striatis; rostro notâ transversâ basali, capite maculis oblongis tribus, harum una inter-oculari, una utrinque suboculari; thorace lineis marginalibus, et suprâ lineis tribus, et unâ transversâ interruptâ, notato; elytris lineâ marginali, lineisque duabus longitudinalibus dorsalibus, nec non lineâ transversâ per medium excurrente, atque lineis duabus abbreviatis et ad angulos basales, et ad subapicales; his lineis maculisque pallide cyaneo-viridibus.

Long. corp. $6\frac{3}{4}$ lin., lat. 3 lin.

This beautiful species is rather larger than *P. moniliferus*; the rostrum is proportionately broader and rather shorter, the thorax is also broader and rather less constricted before and behind, and the elytra are proportionately narrower and more elongated: it is of a rich copper-red colour, but presents a slight æneous tint in parts and in certain lights. The rostrum is very delicately punctured and has a shallowish transverse impression in a line with the base of the antennæ, there is also a broad and very shallow oblong depression on the head—both these depressions are filled with pale blue-green scales, and there is a patch of similar scales on each side beneath the eye and another on the side of the rostrum. The thorax is smooth, has a transverse blue-green line in front and another behind, and these lines are joined by a broader mark on the sides, which passes close to the femora; on the upper surface are three longitudinal marks, and one central transverse mark; this latter is slightly interrupted, otherwise the disc of the thorax would be divided into four areas. The elytra are faintly punctured, and the punctures form striæ; on the apical portion of the elytra the punctures are more distinct: a line of scales borders the outer margin of each elytron, extending from the base almost to the apex: at the base it is recurved and runs up towards the suture, but stopping at a short distance from the suture it sends off a longitudinal line which extends very nearly to the apex of the elytra and there joins the marginal line; this longitudinal line is slightly interrupted in the middle of the elytra, where there is a transverse band. Besides these lines, all of which are formed of pale blue-green scales, there are two abbreviated longitudinal marks running from the base of the elytra on each side, and two small spots situated on the apical half of each elytron.

Pachyrrhynchus cumingi var. *boholensis* var. nov. Plate 9, fig. 19, ♀.

Prothorax with the medial stripe slightly interrupted in the middle, at base triangularly expanded. The dorsolateral longitudinal stripes before the middle expanded spotlike, but no

¹³ Trans. Ent. Soc. London I 3 (1843) 312.

transverse line indicated. Markings of elytra exactly as in the original description, except one rather large spot situated on apical half of each elytron.

Male, length, 13 millimeters (without rostrum); width, 5.5. Female, length, 14 millimeters (without rostrum); width, 6.2.

BOHOL, Bilar (*M. Ramos*).

This species in its general aspect has a slight resemblance to *P. gloriosus* Faust, but the elytra of *P. cumingi* are more elongate.

GROUP XII

This group is typified by *Pachyrrhynchus ardentius* Schultze and contains only one other species, *P. corpulentus* Schultze. In general body form the species resemble some of the species of the *congestus* group.

Key to the species of Pachyrrhynchus, Group XII.

*a*¹. Prothorax with an irregular longitudinal stripe toward each side dorsolaterally. Elytra with stripes and a transverse band, forming a somewhat triangular figure in basal half.... *P. corpulentus* Schultze.

*a*². Prothorax with an irregular spot toward each side dorsolaterally. Elytra with the markings more interrupted than in the former species.

P. ardentius Schultze.

Pachyrrhynchus ardentius Schultze. Plate 3, fig. 11, ♀ (lateral view); Plate 4, fig. 1.

Pachyrrhynchus ardentius SCHULTZE, Philip. Journ. Sci. 15 (1919) 550, pl. 1, fig. 7, ♀.

Glossy glowing purplish red with pale green markings and spots. Rostrum as broad as long, a strongly pronounced cross groove at middle from which there extends to the front a shallow depression, the lateral edges of which are strongly raised. Front densely and finely punctured. Sides of head with a scale spot. Prothorax slightly broader than long, with a posterior submarginal groove. A small triangular scale spot at the middle laterad and a large oblong patch at each lateral margin. Elytra with very faint traces of rows of punctures. Each elytron with the following markings: Three spots at base, one of which, near the lateral margin, is large and oblong; at the middle a small spot discally and a band extending laterally; along margin a large oblong spot, almost confluent with a small triangular spot at apex; beyond the middle at suture a small spot; another sutural spot near apex. Between the last-mentioned spots, somewhat laterad, a long dash, and laterad of the latter two other spots. Femora with a scale spot apically below.

Length, 16.5 millimeters; width, 7.8.

SIARGAO (*Schultze*).

The spots on the elytra in this species seem to vary, since in the above-described type, the only perfect specimen I received, the second basal spot on the left elytron is absent.

Pachyrrhynchus corpulentus Schultze. Plate 2, fig. 5, ♀ (lateral view); Plate 4, fig. 2, ♀.

Pachyrrhynchus ardentius subsp. *corpulentus* SCHULTZE, Deutsche Ent. Zeitschr. (1922) 41, pl. 1, fig. 14, ♀.

Glossy glowing red, the scale markings pale yellowish green. Related to *P. ardentius* Schultze, but the elytra more short-ovate and more strongly inflated. Rostrum in basal half with a shallow depression and an oblong groovelike dentation. Front with an approximately triangular scale spot, another spot at sides of rostrum and head. Prothorax longer than broad, impunctate, with an anteriorly and posteriorly abbreviated longitudinal stripe located laterad of the middle, another broader stripe at each lateral margin. Elytra impunctate, each elytron with a dorsal scale stripe reaching from base to apex but interrupted at the middle, confluent at apex with a marginal stripe. At about the middle an abbreviated crossband which is confluent with the dorsal stripe, thus forming a triangle in basal half. Inside the latter an oblong longitudinal and another oblique spot. In apical half a short longitudinal stripe parallel to the marginal stripe and in the dorsolateral area an oblong oblique spot. Aside from the above markings a small subsutural spot behind the middle and another near apex. In the male the indicated markings are more disconnected or interrupted than in the female. Femora with a small patch of scattered scales apically below.

Male, length, 13 millimeters (without rostrum); width, 5.6. Female, length, 14.5 millimeters (without rostrum); width, 7.

MINDANAO, Bukidnon Province, Lindabon (*Schultze*).

This species I described originally as a subspecies of *P. ardentius* and it is undoubtedly related to the latter, but it is sufficiently distinct to merit specific rank.

GROUP XIII

This group is typified by *Pachyrrhynchus pinorum* Pasc. The species pertaining to this group differ strikingly in general appearance from the other species of the genus. Large and slenderly built species, general color black. Prothorax always

longer than broad. Elytra very oblong-ovate. Scales very minute and rudimentary, mostly grayish.

Key to the species of Pachyrrhynchus, Group XIII.

- a*¹. Elytra with well-pronounced longitudinal grooves and ridges.
 - b*¹. Elytra with the grooves and ridges well defined and regular.
 - c*¹. Each elytron with seven regular narrow and continuous ridges, basal half with a broad smooth subsutural stripe, apical half with two short subsutural elliptical depressions with short ridges.

P. pinorum Pascoe.
 - c*². Each elytron with seven continuous and two additional ridges in apical half only..... *P. pinorum* Pasc. var. *dimidiatus* Heller.
 - c*³. Elytra, the longitudinal ridges confluent in the middle with a more or less pronounced cross ridge.

P. pinorum Pasc. var. *transversalis* Heller.
 - b*². Elytra with the grooves and ridges ill defined and irregular. The latter usually connected by cross ridges in the middle, the grooves broad with rather rudimentary secondary ridges.

P. dubiosus Schultze.
- a*². Elytra without well-pronounced grooves or ridges, at most with obsolete traces, otherwise smooth, and with oblong shallow depressions or slightly depressed spots.
 - d*¹. Elytra in basal half with abbreviated stripelike shallow depressions beset with rudimentary scales, apical half with slightly depressed oblong spots..... *P. lacunosus* Heller.
 - d*². Elytra with small, oval, slightly impressed and well-defined grayish scale spots..... *P. tristis* Heller.
 - d*³. Elytra smooth and glossy with rather large and irregular dull spots.

P. consobrinus Schultze.

Pachyrrhynchus pinorum Pascoe. Plate 2, fig. 11 (lateral view); Plate 4, fig. 11, ♀.

Pachyrrhynchus pinorum PASC., Journ. Linn. Soc. London 11 (1873) 156; HELLER, Abh. u. Ber. Königl. Zool. Anthr.-Ethnogr. Mus. Dresden 7 (1898-99) 6; HELLER, Philip. Journ. Sci. § D 7 (1912) 306; SCHULTZE, Philip. Journ. Sci. 16 (1920) 200.

Pachyrrhynchus pinorum var. *dimidiatus* HELLER, Philip. Journ. Sci. § D 7 (1912) 306.

Pachyrrhynchus pinorum var. *transversalis* HELLER, Philip. Journ. Sci. § D 7 (1912) 306.

Black, moderately glossy, elytra with alternating longitudinal grooves and ridges, the former beset with very fine grayish or white scales. Rostrum divergent toward apex, apical half scatteredly punctured, basal half with a well-pronounced triangular depression. Sides of rostrum beset with fine silver grayish hair, sides of head below eye with a small patch of white scales. Prothorax longer than broad, with an indistinct anterior submarginal groove. Dorsolaterally at the latter a

small scale spot; another, also dorsolaterally, near the middle; and still another, more dorsally, at the posterior submarginal groove. Lateral margins with a larger scale patch. Elytra oblong-ovate, each elytron with ten longitudinal grooves and ridges, of which the first and second grooves are present only in apical half (= var. *dimidiatus* Heller), or the first two abbreviated grooves are interrupted by a cross ridge thus forming two oblong subsutural depressions (typical form). Mesosternum, metasternum, and first abdominal sternite with a spot laterally. Femora with a scale spot near apex. Penis structure, Plate 3, fig. 17.

Male, length, 17 to 18 millimeters (without rostrum); width, 6.2 to 6.5. Female, length, 15.5 to 20 millimeters (without rostrum); width, 6 to 8.

LUZON, Benguet Subprovince, Baguio (pine region); Mountain Trail between Baguio and rest house, near kilometer 88 (McGregor; Curran; Taylor; Schultze).

Pachyrrhynchus pinorum var. *transversalis* Heller. Plate 4, fig. 12, ♂.

Pachyrrhynchus pinorum var. *transversalis* HELLER, Philip. Journ. Sci. § D 7 (1912) 306.

The grooves on the elytra interrupted in the middle by a narrow or broad transverse smooth ridge.

Pachyrrhynchus pinorum Pascoe and the varieties *dimidiatus* and *transversalis* Heller are found together in the same localities, in the pine regions of Benguet Province, at altitudes of from 1,200 to 1,800 meters. On higher mountain ranges this species seems to be replaced by other nearly related species, such as *P. dubiosus* Schultze and *P. lacunosus* Heller. The fine white scales of *P. pinorum* are plainly visible only in very fresh specimens; I collected and examined hundreds of specimens in which the scales appear grayish or are almost invisible, due to a certain infiltration of greasy substances. The original description by Pascoe is as follows:

Pachyrrhynchus pinorum. *P. niger*, nitidus, fere toto glaber; rostro apice tenuiter punctato, sulco transverso obsoleto, in medio fortiter triangulariter excavato; prothorace oblongo, utrinque rotundato, margine antico sulcato; elytris canaliculatis, canaliculis squamis concoloribus indistinctis indutis, interstitiis valde convexis, subtiliter transversim corrugatis, regione suturali postice maculis quatuor pupillato-impressis, 2 pone medium, 2 apicem versus obsitis, abdomine tenuiter transverse corrugato; tibiis intus subdenticulatis. Long. 9 lin.

Hab. Luzon.

Pachyrrhynchus tristis Heller. Plate 2, fig. 13 (lateral view); Plate 8, fig. 11, ♂.

Pachyrrhynchus tristis HELLER, Philip. Journ. Sci. § D 7 (1912) 315.

Glossy black, prothorax and elytra with small grayish scale spots. Rostrum in apical half coarsely and scatteredly punctured, basal half with a strongly pronounced, triangular roundish depression beset with two small scale spots. Sides of head with a small spot below eye. Prothorax longer than broad with a rudimentary, indicated anterior submarginal groove. At anterior margin toward each side a small, and behind the middle another, larger, scale spot, still another larger spot at lateral margins. Elytra finely coriaceous with very faint and indistinct traces of longitudinal grooves, which are still more or less distinctly indicated near apex, in the male particularly a rudimentary fraction of the first groove and a swollen ridge being mostly present. Each elytron with two small oval scale spots near base and mostly four other spots in apical third. Penis structure, Plate 3, fig. 14.

Male, length, 17.8 millimeters (without rostrum); width 6.2. Female, length, 17.5 millimeters (without rostrum); width, 7.

LUZON, Benguet Subprovince; two specimens, which I obtained in exchange.

In its systematic position, this species is closely related to *P. lacunosus* Heller and *P. consobrinus* Schultze.

Pachyrrhynchus lacunosus Heller.

Pachyrrhynchus lacunosus HELLER, Philip. Journ. Sci. § D 7 (1912) 316.

Glossy black, elytra with broad but shallowly depressed longitudinal stripes and spots, beset with grayish scales. Rostrum in apical half finely and moderately densely punctured, basal half with a well-pronounced depression, front with a shallow depression bearing a patch of scales. Prothorax longer than broad, greatest width before the middle, very finely and scatteredly punctured. At anterior margin toward each side a large spot, another small roundish spot also toward each side near posterior margin, and a small oblong spot in the middle at lateral margin. Elytra with slight traces of puncture rows. An oblong sub-sutural and slightly depressed spot in the middle and another near apex. Another elongated marking in the second interstice reaching from base to middle and behind it another elongate spot. Fourth interstice at basal half and near apex with another oblong spot. A submarginal slightly depressed

stripe mostly interrupted at the middle is continued near apex as a spotlike depression, the interstice at apex forming a strongly pronounced ridge.

Female, length, 18.5 millimeters (without rostrum); width, 7.6.

LUZON, Benguet Subprovince, Mount Pulogloko (*M. Ramos*).

Pachyrrhynchus dubiosus Schultze. Plate 7, fig. 7, ♀.

Pachyrrhynchus dubiosus SCHULTZE, Philip. Journ. Sci. 21 (1922) 574, pl. 3, fig. 4.

Black, elytra with broad somewhat irregular longitudinal furrows beset with very small grayish or nearly colorless scales. Rostrum toward apex strongly divergent, apical half scatteredly punctured, basal half with a strongly pronounced depression and medial groove. Prothorax longer than broad, finely punctate, a small patch of irregular coarser punctures located dorsolaterally near posterior margin. Elytra coriaceous. Each elytron with four broad furrows, the one next to lateral margin not so deep or so strongly depressed as the others. First and second furrows, for the entire length or less, third furrow only in apical half, with a narrow ridge. The furrows are more or less interrupted in the middle by cross connections of the prominent primary ridges or interstices. Another furrowlike depression in apical fourth and an oblong subsutural depression behind the middle and at apex. The interstices between the depressions in apical fourth are very strongly bulgingly pronounced. Femora with a coarse rugose patch on underside apically. Penis structure, Plate 3, fig. 13.

Male, length, 18 millimeters (without rostrum); width, 7. Female, length, 21 millimeters (without rostrum); width, 8.5.

LUZON, Benguet Subprovince, Mount Santo Tomas and Pauai (Haight's place) (*Schultze*).

Pachyrrhynchus consobrinus Schultze. Plate 2, fig. 12 (lateral view); Plate 9, fig. 7, ♀.

Pachyrrhynchus consobrinus SCHULTZE, Philip. Journ. Sci. 21 (1922) 574, pl. 2, fig. 5, ♂.

Glossy black, elytra with large dull and achromatic scale spots. Rostrum in apical half finely scatteredly punctured, basal half with a strongly pronounced triangular depression. Prothorax longer than broad, shiny black, very finely and scatteredly punctured, a small roundish spot toward each side near anterior margin, another behind the middle, and a large patch

at lateral margins. Elytra in the male very oblong-ovate, in the female stouter in build; greatest width before the middle. A submarginal row of coarse punctures in apical half which becomes groovelike near apex. Each elytron with two large roundish dull grayish spots basally; three other large spots form a cross row before the middle and are usually more or less confluent. Another cross row of four spots in apical third and a large spot in apical triangle. Besides the above markings a sutural spot behind the middle and a large one at apex.

Male, length, 17.6 millimeters (without rostrum); width, 6.3. Female, length, 19 millimeters (without rostrum); width, 7.6.

LUZON, Bontoc Subprovince, Mount Polis (Schultze).

This species is related to *P. tristis* Heller.

GROUP XIV

This small group is typified by *Pachyrrhynchus amabilis* Schultze and contains only two species, the one just mentioned and *P. chamissoi* Schultze. Both species are characterized by having the general color of the head, prothorax, and legs in strong contrast to that of the elytra.

Key to the species of Pachyrrhynchus, Group XIV.

- α^1 . Elytra, the greater part densely beset with pale pinkish scales, the bare areas forming a large cross..... *P. amabilis* Schultze.
- α^2 . Elytra near the middle with a transverse row of white spots, or entirely bluish black (σ)..... *P. chamissoi* Schultze.

Pachyrrhynchus amabilis Schultze. Plate 2, fig. 6 (lateral view);

Plate 7, fig. 13.

Pachyrrhynchus amabilis SCHULTZE, Deutsche Ent. Zeitschr. (1922) 38, pl. 1, fig. 10.

Head, prothorax, and legs except the tarsi very glossy glowing red. Antennæ, tarsi, and elytra very dark bluish green. The crossband on prothorax and the large scaled areas on elytra pale pink. Rostrum sparsely punctured in apical half, basal half with a rectangular depression and a longitudinal median groove. The depression bearing an oblong scale spot, another spot at sides of head. Prothorax as long as broad, very finely and scatteredly punctured, with a scale band along anterior margin and another along posterior margin, the latter discally somewhat denticulated. Both bands united at lateral margins. Elytra dull dark bluish green, with fine but very regular rows of punctures. Each elytron with a very large scaled area at

basal half and another at apical half. These areas reach from about the first puncture row to side margin and are separated by a bare crossband in the middle. The bare areas on elytra form approximately a crosslike figure. Underside of mesothorax and metathorax laterally with a large scale spot.

Male, length, 14.5 millimeters (without rostrum); width, 6.

MINDANAO, Bukidnon Province, Lindabon. (*Schultze*).

This is also a very strikingly colored and somewhat isolated species of the genus.

Pachyrrhynchus chamissoi Schultze. Plate 1, fig. 21, ♀ (lateral view); Plate 7, fig. 14, ♀; fig. 15, ♂.

Pachyrrhynchus chamissoi SCHULTZE, Deutsche Ent. Zeitschr. (1922) 39, pl. 1, fig. 9, ♀.

Head, prothorax, and legs glossy dark glowing red with a violet sheen. Antennæ, elytra, and tarsi bluish black. Rostrum divergent toward apex, basal half with strongly pronounced squarish depression, the lateral margins of which form prominent ridges which are transversely set off from front by a shallow cross groove in the male. The depression with a longitudinal median groove and an oblong scale spot, the latter mostly absent in the males. Prothorax as long as broad, finely punctured, with an indistinct anterior submarginal groove. Sides with two small irregular white scale spots in the female. Elytra dull, very finely coriaceous, each elytron with nine distinct and regular rows of punctures. In the female before the middle a cross row of larger or smaller white scale spots interrupted by the longitudinal rows of punctures. In apical third mostly an oblong and two small roundish spots. All the spots are variable and seem to be absent in the males. Mesothorax and metathorax laterally with a scale spot.

Male, length, 12 millimeters (without rostrum); width, 5.

Female, length, 13.5 millimeters (without rostrum); width, 6.

MINDANAO, Bukidnon Province, Lindabon (*Schultze*).

On Plate 7, fig. 14, I have figured a female selected from a large series of specimens with extraordinarily and unusually large markings on the elytra.

GROUP XV

This group contains a number of species which are rather isolated from any of the other groups as well as among themselves. Included are the following: *Pachyrrhynchus argus*

Pascoe, *P. ochroplagiatus* Heller, *P. perpulcher* Waterh., *P. atrocyaneus* Schultze, *P. basilanus* Heller, and *P. croesus* R. Oberth.

Key to the species of Pachyrrhynchus, Group XV.

α^1 . Medium to large.

b^1 . Elytra with large and strongly impressed creamy white ring spots.
P. argus Pascoe.

b^2 . Elytra without impressed ring spots.

c^1 . Prothorax with scale markings.

d^1 . Prothorax with two brilliant golden green, dorsolateral spots at anterior and posterior margins. General color dark purplish red to black..... *P. perpulcher* Waterh.

d^2 . Prothorax with two small dorsolateral spots at anterior margin, and two large elongate dorsolateral spots in basal half, all spots light blue. General color dark bluish black.

P. croesus R. Oberth.

c^2 . Prothorax without any scale markings. Elytra with twelve ochraceous spots..... *P. ochroplagiatus* Heller.

c^3 . Elytra with sixteen to eighteen spots.

P. ochroplagiatus var. *multiplagiatus* var. nov.

α^2 . Small.

e^1 . Elytra with a transverse brick red band in basal half.

P. basilanus Heller.

e^2 . Elytra with ivory white spots..... *P. atrocyaneus* Schultze.

Pachyrrhynchus argus Pascoe. Plate 1, fig. 17, ♀ (lateral view); Plate 4, fig. 10.

Pachyrrhynchus argus PASCOE, Journ. Linn. Soc. London 11 (1873) 154, pl. 6, fig. 6; BEHR., Stett. Ent. Zeitg. (1887) 250; HEYDEN, Ber. Senkenb. Naturf. Ges. (1911) 84, pl. 1, fig. 2; HELLER, Philip. Journ. Sci. § D 7 (1912) 311.

Glossy black; prothorax and elytra with large impressed ring spots beset with creamy white scales. Rostrum in apical half scatteredly punctured, basal half with a strongly pronounced triangularly rounded depression. Front with two very small scale spots next to each eye and a spot on sides of head. Prothorax as long as broad, the sides slightly rounded, dorsolaterally two irregular ring spots and a smaller irregular ringlike figure at lateral margins. Elytra oblong-ovate, with twenty-four large ring spots, two of which are bifid sutural spots, one located slightly behind the middle, the other in apical fourth. Underside; mesosternum, metasternum, and first abdominal sternite with a spot laterally. Femora with a scale spot near apex. Penis structure, Plate 3, fig. 26.

Male, length, 13 to 15.5 millimeters (without rostrum); width, 5 to 6.8. Female, length, 14 to 18 millimeters (without rostrum); width, 6.2 to 7.8.

LUZON, Benguet Subprovince, Baguio; Mount Santo Tomas; Trinidad; Mountain Trail near rest houses at kilometers 30 and 88; Pauai (Haight's place); Mount Polis; Mount Pulog (McGregor; Curran; Schultze).

In fresh specimens the color markings are creamy or ivory white, in older examples ochraceous or pale brown. This species seems to be rather widely distributed over the mountain regions of northern Luzon at altitudes of from 1,500 to 2,800 meters.

Pachyrrhynchus ochroplagiatus Heller. Plate 4, fig. 9, ♀.

Pachyrrhynchus ochroplagiatus HELLER, Philip. Journ. Sci. § D 7 (1912) 311, pl. 2, fig. 11; SCHULTZE, Philip. Journ. Sci. 21 (1922) 593, pl. 3, fig. 6 (penis structure).

Glossy black; head and prothorax without spots, elytra with ochraceous scale spots. Rostrum, apical half irregularly punctured, basal half with a deep roundish depression, the dorso-lateral edges swollen. Prothorax a little longer than broad, the sides slightly rounded, the greatest width before the middle nearer anterior margin, a small shallow depression laterad near posterior margin. Elytra impunctate, glossy. Each elytron with six ochraceous scale spots, two at base and four in apical half; of the latter, two are located dorsolaterally, one at margin and one at apex. Underside uniformly black. Penis structure, Plate 3, fig. 15.

Male, length, 15.5 millimeters (without rostrum); width, 7. Female, length, 17.5 millimeters (without rostrum); width, 7.7.

LUZON, Benguet Subprovince, Mount Pulog (McGregor; Curran). The specimens from the above locality show very little variation, but others received from Mount Lusong, Benguet (M. Ramos) are rather variable from the typical form in the number of spots on the elytra. This variation I designate—

Pachyrrhynchus ochroplagiatus var. *multiplagiatus* var. nov. Plate 1, fig. 18 (lateral view).

Each elytron with eight or nine spots, located as follows: Two at base, one small spot behind dorsal basal spot, and five in apical half, three of which form a cross row. Another specimen has an additional spot in the middle at outer margin.

Pachyrrhynchus perpulcher Waterh. Plate 1, fig. 23 (lateral view); Plate 9, fig. 1.

Pachyrrhynchus perpulcher WATERH., Proc. Ent. Soc. London (1841) 19; Ann. & Mag. Nat. Hist. 8 (1841) 218; Trans. Ent. Soc. London I 3 (1843) 312; SCHOENH., Gen. Curc. Suppl. 8 (1845) 382; HELLER, Philip. Journ. Sci. § D 7 (1912) 307, pl. 1, fig. 18.

Glossy black with a purplish sheen, prothorax and elytra with brilliant green, coppery, and bluish more or less ocellated scale spots. Rostrum in apical half scatteredly punctured, basal half with an oblong triangular depression extending to front, latter with an elongate scale spot. Sides of rostrum and head also with a scale patch. Prothorax broader than long, very finely and remotely punctate, with a roundish scale spot toward each side dorsolaterally at anterior margin and two others at posterior margin. Lateral margins with a broad scale patch. Elytra indistinctly punctate-striate. Each elytron with nine scale spots, two at base, two in the middle and two in apical third forming transverse rows; a smaller marginal spot is located at basal third, a large oblong marginal spot behind the middle, and a triangular spot near apex. Prosternum, mesosternum, and metasternum more or less closely beset with scales. Femora with an oblong scale spot in the middle and another near apex.

Male, length, 12 millimeters (without rostrum); width, 5.6. Female, length, 14 millimeters (without rostrum); width, 6.6.

LUZON, Kalinga Subprovince, Pinukpuk (*Herre*).

Among the material at my disposal this species was represented by only one old specimen labeled Luzon. Recently several specimens were collected by Doctor Herre at the above locality.

Pachyrrhynchus atrocyaneus Schultze. Plate 2, fig. 9, ♀ (lateral view); Plate 9, fig. 4, ♀.

Pachyrrhynchus atrocyaneus SCHULTZE, Deutsche Ent. Zeitschr. (1922) 40, pl. 1, fig. 12, ♀.

Glossy dark blue, prothorax and elytra with creamy white scale markings and spots. Rostrum in basal half with a strongly pronounced squarish depression. A scale spot on sides of head. Prothorax longer than broad, the greatest width before the middle, at base strongly constricted. A narrow scale stripe along anterior margin, continued at lateral margins, ending at poste-

rior margin laterally, and a triangular spot dorsally at posterior submarginal groove. Elytra cordiform, with prominent longitudinal rows of large and uniform punctures, the interspaces between the puncture rows raised. Each elytron with nine small scale spots and a large oblong marginal patch in the middle. Two spots at base, three form a cross row at basal third, three others form another cross row at apical third, and one spot in apical triangle. Legs glossy brownish black.

Male, length, 9 millimeters (without rostrum); width, 3.8. Female, length, 12 millimeters (without rostrum); width, 5.

MINDANAO, Zamboanga Province, Zamboanga (*Schultze*).

This species seems to be rather isolated from other members of the genus.

Pachyrrhynchus basilanus Heller. Plate 8, fig. 13.

Pachyrrhynchus basilanus HELLER, Tijdschr. v. Ent. 66 (1923) 47, pl. 1, fig. 12.

Head and prothorax very dark bronze green, elytra black, slightly greenish glossy, with dull brick red scale markings. Rostrum with the dorsal depression slightly longer than broad. Prothorax with an anterior marginal scale band confluent with an elongate stripe at each lateral margin, dorsally at the base a triangular scale spot. Elytra strongly and regularly striate-punctate, apically somewhat prolonged. A broad transverse scale band at basal third and a large triangular scale patch at apical third. Metasternum and first abdominal sternite with a scale spot laterally. Legs also dark bronze green, except apical part of hind femora which is purplish.

Length, 11 millimeters; width, 5.

BASILAN (*C. F. Baker*).

This species I know mainly from Heller's description, although I saw the unique specimen in 1921 in Dresden; strange to say, Heller does not mention the oblong triangular dorsal scale spot on the prothorax in his description, though it is indicated in the figure. This species and *P. atrocyaneus* Schultze are somewhat isolated species of this genus which seem to represent more or less intermediate forms between this genus and *Sphenomorpha* Behrens, representatives of which are known only from the Moluccas and the New Guinea region. This species and *Doliops basilana* Heller¹⁴ have a strong mimicry resemblance.

¹⁴ Tijdschr. v. Ent. 66 (1923) 45, pl. 1, fig. 9.

Pachyrrhynchus croesus R. Oberth. Plate 9, fig. 8.

Pachyrrhynchus croesus R. OBERTH., Ann. Mus. Civ. Stor. Nat. Geneva 14 (1879) 570, pl. 1, fig. 2; BEHR., Stett. Ent. Zeitg. (1887) 254; HELLER, Philip. Journ. Sci. § D 7 (1912) 307, pl. 1, fig. 17.

Glossy bluish black, prothorax and elytra with light blue scale spots. Rostrum in basal half with a large triangular depression and medial groove. The depression separated from front by a cross groove. Front, sides of rostrum, and head below eye with a scale spot. Prothorax longer than broad, greatest width before the middle, very finely punctate, toward each side in basal half a large oblong scale spot. At anterior margin laterally a scale band and an oblong spot at lateral margins. Elytra very indistinctly striate-punctate, with twenty-two or twenty-four scale spots. Two or three spots located at base, of which the one next to lateral margin is oblong; four others form a cross row before the middle, the lateral marginal one of which is the largest and is directed backward; three other spots form another cross row in apical third, a triangular spot next apex, and a bifid sutural spot slightly behind middle. Underside, mesosternum, metasternum, and first and second abdominal sternites laterally with a large scale spot. Femora with a spot on underside next to apex.

Length, 18 to 21 millimeters (without rostrum); width, 7 to 7.5.

Moluccas, Sangir Island.

This species I know only from the descriptions.

ADDENDA

Some material was received too late to be included in its proper place.

To the notes on *Pachyrrhynchus orbifer* var. *inornatus* Waterh. and var. *circulifer* Chevr., Philip. Journ. Sci. 23 (1923) 640, add:

During November and December, 1923, my friend Mr. McGregor, while collecting in Ilocos Norte Province, paid special attention to observing and collecting the different forms of *P. orbifer*. At Bangui he found the form as shown in Plate 6, fig. 4, predominating but associated with a lesser number of forms of the var. *circulifer*, Plate 6, fig. 2, and intermediates, fig. 3; the forms were frequently collected together, in copula. In the vicinity of Solsona forms were collected which are very constant in the markings, the latter being similar to those shown

in fig. 2 but much finer, or only indicated as traces. Specimens from around Piddig are about 90 per cent uniformly black, and only a few have faint markings like those from the former locality.

After the description of *P. erichsoni eschscholtzi*, Philip. Journ. Sci. 23 (1923) 665, add:

Pachyrrhynchus erichsoni eschscholtzi var. *ilocanus* var. nov.

Black; head, prothorax, and legs very glossy. Elytra with the puncture rows very faintly indicated. All spots consisting of rather brilliant violet scales. Each elytron with ten spots; two near the base, three form an irregular transverse row at the middle, one behind the middle at the lateral margin, three form a cross row at the apical third, and one near the apex.

LUZON, Ilocos Norte Province, Bangui (McGregor).

This interesting local variety from northern Luzon enlarges still more the distribution range of *P. erichsoni*, although the latter already holds the record for the relatively widest distribution.

The description of a new species, here given, should follow the description of *P. semperi*:

Pachyrrhynchus negrosensis sp. nov.

Very glossy black, with narrow pale reddish scale stripes. The markings very similar to those in *P. semperi* Heller. Rostrum in basal half strongly depressed, with a well-pronounced medial groove and a bifid scale spot. The groove not extending to the front, the latter finely and scatteredly punctured. Sides of head with a scale spot below eye. Prothorax relatively small, as long as broad, sides very slightly rounded, with a narrow irregular anterior submarginal band confluent with a broader stripe at each lateral margin. Along the posterior margin some scattered scales, and dorsolaterally in the basal half an abbreviated stripe. Elytra similar in form to those of *P. stellio* Heller, finely but regularly striate-punctate, the punctures coarser toward apex. Basal half in the third interstice with an abbreviated longitudinal stripe not quite reaching the narrow transverse band before the middle, but confluent at the base with an irregular submarginal stripe. The latter is shortly interrupted near apex and terminates as an elongate subapical spot. Each elytron furthermore in apical half with three short abbreviated stripes in the third, fifth, and seventh

interstices, and an elongate subsutural dash near apex. Prosternum, mesosternum, and metasternum beset with scattered scales. Femora with a subapical band of scattered scales. Tibiæ relatively slender and long.

Male, length, 12.5 millimeters (without rostrum); width, 5.8.

NEGROS, Occidental Negros Province, Cuernos Mountains, 1,800 meters (*J. W. Chapman*).

This species has a strong superficial resemblance to *P. semperi* Heller but is much smaller; furthermore, in the latter species the rostrum is different and the prothorax is longer than broad. *Pachyrrhynchus negrosensis* is to be placed under Group X as follows:

- ♂³. Each elytron in the apical half with three abbreviated longitudinal stripes *P. negrosensis* sp. nov.

ILLUSTRATIONS

[Original colored drawings, except Plate 8, by W. Schultze; drawings of Plate 8, by Max Böhme. All figures enlarged about $\times 1.5$.]

PLATE 7

- FIG. 1. *Pachyrrhynchus sulphureomaculatus* Schultze, female. Mindanao, Cotabato, Cotabato.
 2. *Pachyrrhynchus benguetanus* sp. nov., male. Luzon, Benguet.
 3. *Pachyrrhynchus gemmatus* subsp. *purpureus* Kraatz, female. Luzon, Cagayan, Sanchez Mira.
 4. *Pachyrrhynchus sarcitis* Behr., female. Calayan Island.
 5. *Pachyrrhynchus confusus* Schultze, female. Luzon, Laguna, Los Baños.
 6. *Pachyrrhynchus viridans* Heller, female. Calayan Island.
 7. *Pachyrrhynchus dubiosus* Schultze, female. Luzon, Benguet, Mount Santo Tomas.
 8. *Pachyrrhynchus chlorites* Chevr., female. Calayan Island.
 9. *Pachyrrhynchus apicatus* Schultze, female. Polillo Island.
 10. *Pachyrrhynchus venustus* Waterh., female. Mindanao, Surigao, Surigao.
 11. *Pachyrrhynchus taylori* Schultze, female. Luzon, Kalinga, Balaban.
 12. *Pachyrrhynchus taylori* subsp. *metallescens* subsp. nov., male. Luzon, Ifugao, Polis Pass.
 13. *Pachyrrhynchus amabilis* Schultze, female. Mindanao, Bukidnon, Lindabon.
 14. *Pachyrrhynchus chamissoi* Schultze, female. Mindanao, Bukidnon, Lindabon.
 15. *Pachyrrhynchus chamissoi* Schultze, male. Mindanao, Bukidnon, Lindabon.
 16. *Pachyrrhynchus rufopunctatus* Waterh., male. Polillo Island.

PLATE 8

- FIG. 1. *Pachyrrhynchus psittacinus* Heller. Luzon, Bataan, Lamao.
 2. *Pachyrrhynchus lorquini* Chevr. Luzon, Laguna.
 3. *Pachyrrhynchus eques* Heller. Luzon, Cagayan, Abulog River.
 4. *Pachyrrhynchus congestus* subsp. *pavonius* Heller, female. Luzon, Nueva Vizcaya, Imugan.
 5. *Pachyrrhynchus pulchellus* var. *bakeri* Heller, female. Luzon, Benguet, Baguio.
 6. *Pachyrrhynchus infernalis* Fairm. Yayoyama, Ishigaki-shima.
 7. *Pachyrrhynchus psittaculus* Heller.
 8. *Pachyrrhynchus forsteni* Vollh., female. Ternate.
 9. *Pachyrrhynchus morotaiensis* Vollh. Halmahera.

- FIG. 10. *Pachyrrhynchus möllendorffi* Heller.
 11. *Pachyrrhynchus tristis* Heller, male. Luzon.
 12. *Pachyrrhynchus nobilis* Heller.
 13. *Pachyrrhynchus basilanus* Heller. Basilan.
 14. *Pachyrrhynchus semperi* Heller.
 15. *Pachyrrhynchus dohrni* Behr., female.
 16. *Pachyrrhynchus helleri* Kuntzen, female. Luzon.

PLATE 9

- FIG. 1. *Pachyrrhynchus perpulcher* Waterh., female. Luzon.
 2. *Pachyrrhynchus signaticollis* Schultze, male. Mindanao, Agusan, Agusan River.
 3. *Pachyrrhynchus apocyrtoides* Schultze, male. Mindanao, Bukidnon, Lindabon.
 4. *Pachyrrhynchus atrocyaneus* Schultze, female. Mindanao, Zamboanga.
 5. *Pachyrrhynchus libucanus* sp. nov., male. Libucan Island near Samar.
 6. *Pachyrrhynchus smaragdinus* Behrens.
 7. *Pachyrrhynchus consobrinus* Schultze, female. Luzon, Bontoc.
 8. *Pachyrrhynchus croesus* Oberth. Sangir Island.
 9. *Pachyrrhynchus halconensis* Schultze, female. Mindoro, Mount Halcon.
 10. *Pachyrrhynchus morio* Heller, male. Luzon, Benguet, Mount Lusong.
 11. *Pachyrrhynchus roseomaculatus* Waterh., male. Luzon?
 12. *Pachyrrhynchus semiignitus* Schultze, male. Mindanao, Cotabato, Pikit.
 13. *Pachyrrhynchus pseudoproteus* Schultze. Luzon, Laguna.
 14. *Pachyrrhynchus regius* Schultze, male. Leyte, Cabalian.
 15. *Pachyrrhynchus erichsoni* Waterh., male. Dinagat Island.
 16. *Pachyrrhynchus schönherri* Waterh., female. Cotype from British Museum.
 17. *Pachyrrhynchus latifasciatus* Waterh., male. Cotype from British Museum.
 18. *Pachyrrhynchus samarensis* sp. nov. Samar, Catarman.
 19. *Pachyrrhynchus cumingi* var. *boholensis* var. nov., female. Bohol, Bilar.



PLATE 7.

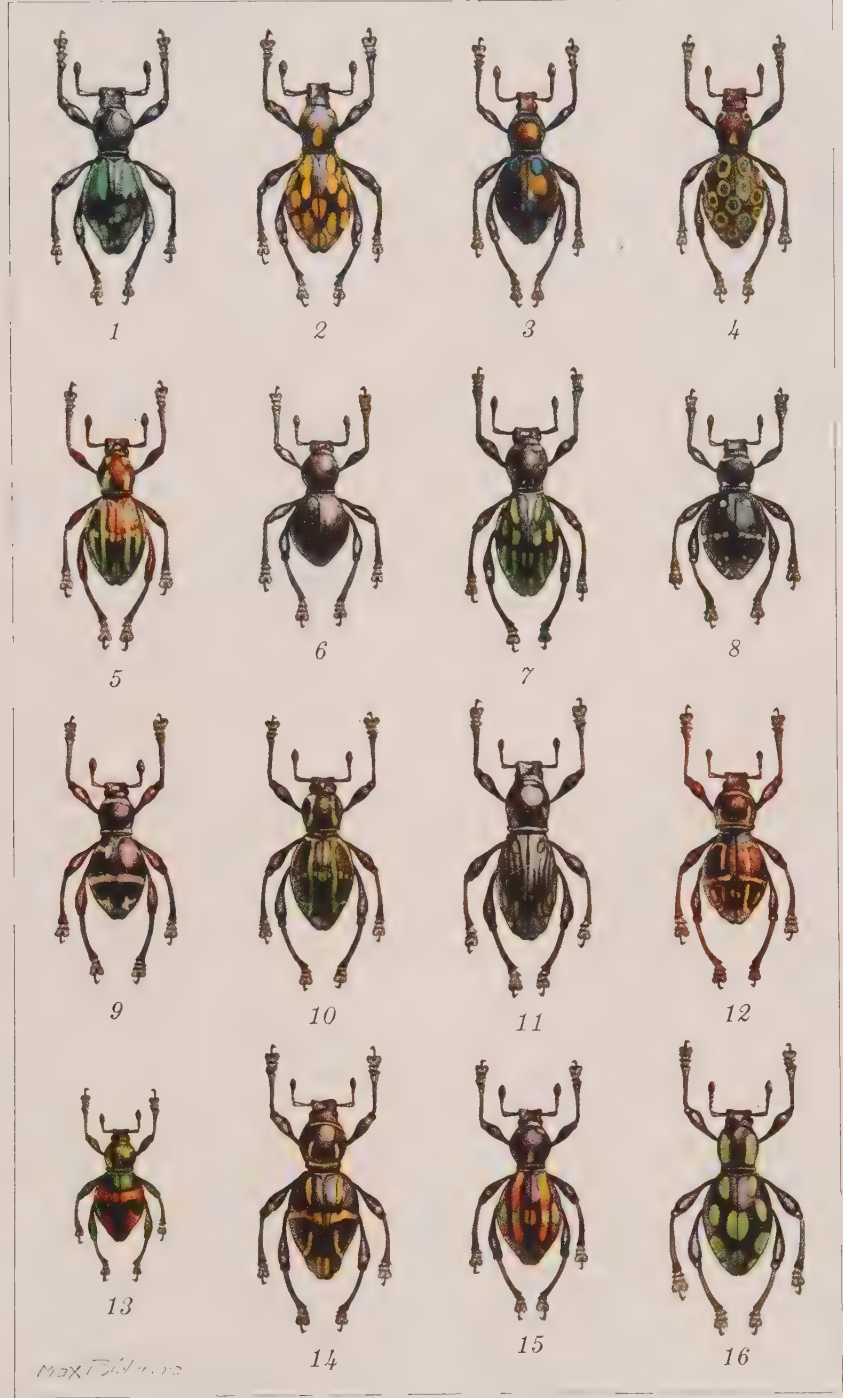


PLATE 8.

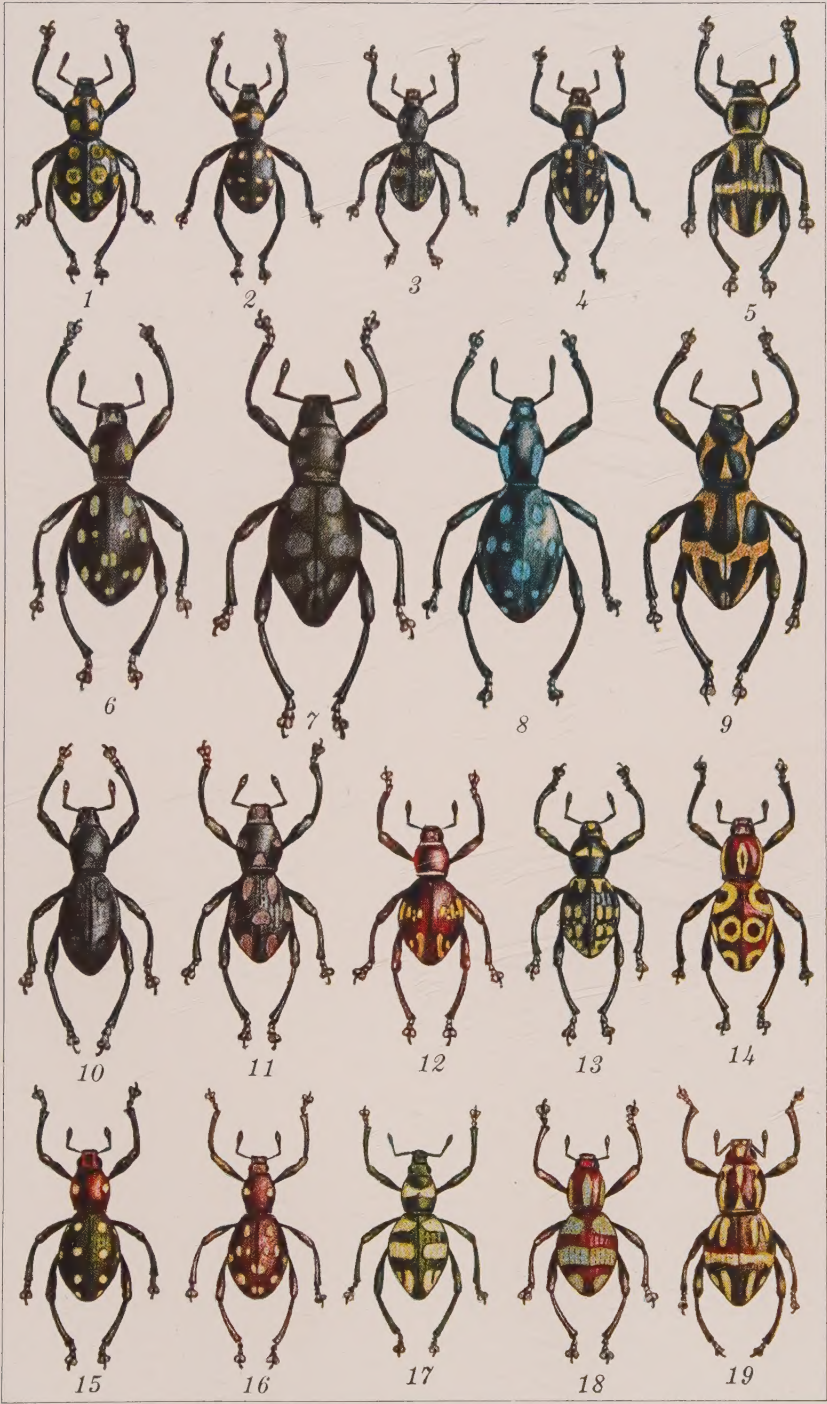


PLATE 9.

NOMENCLATORIAL NOTES ON THE JASSOIDEA

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The following repetitions of names in the Jassoidea require renaming, in connection with the preparation of a list of the jassoid insects of the world. No record is at hand showing that these changes have yet been made and hence the following new names are suggested:

Penthimia distanti nom. nov. for *P. nitida* Distant 1912, not Lethierry 1877.

Goniozygum (*Goniognathus*) *appellans* nom. nov. for *G. obesus* Distant 1918, not Jacobi 1910.

Deltocephalus deletus nom. nov. for *D. thoracicus* Distant 1908, not Fieber 1869.

Scaphoideus ineffectus nom. nov. for *S. tessellatus* Distant 1917, not Osborn 1909.

Thamnotettix montivagus nom. nov. for *T. montanus* Matsumura 1914, not Van Duzee 1892.

Thamnotettix placatus nom. nov. for *T. placidus* Osb. 1905, not Horvath 1897.

Idiocerus kirschbaumi nom. nov. for *I. cupreus* Kirschbaum 1868, not Walker 1851.

Idiocerus incertus nom. nov. for *Idiocerus maculatus* Distant 1912, not Melichar 1896.

